PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Assistant Commissioner for Patents
United States Patent and Trademark Office
Box PCT
Washington, D.C.20231
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 13 January 2000 (13.01.00)	
International application No. PCT/SE99/00416	**Applicant's or agent's file reference** D 1920-1 WO
International filing date (day/month/year) 16 March 1999 (16.03.99)	**Priority date** (day/month/year) 17 March 1998 (17.03.98)
Applicant HECKENMÜLLER, Harald et al	

1. The designated Office is hereby notified of its election made:

   [X] in the demand filed with the International Preliminary Examining Authority on:

   12 October 1999 (12.10.99)

   [ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

   [ ] was not

   made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer R. E. Stoffel
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

Form PCT/IB/331 (July 1992)

3050110

F ENT COOPERATION TREA

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)

To:

ASTRAZENECA AB
Intellectual Property, Patents
S-151 85 Södertälje
SUÈDE

Date of mailing (day/month/year)
23 June 2000 (23.06.00)

Applicant's or agent's file reference
D 1920-1 WO

IMPORTANT NOTIFICATION

International application No.
PCT/SE99/00416

International filing date (day/month/year)
16 March 1999 (16.03.99)

1. The following indications appeared on record concerning:

[X] the applicant [ ] the inventor [ ] the agent [ ] the common representative

Name and Address
ASTRA AKTIEBOLAG
Alfred von Schuckmann

State of Nationality: SE
State of Residence: SE
Telephone No.:
Facsimile No.:
Teleprinter No.:

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

[X] the person [ ] the name [ ] the address [ ] the nationality [ ] the residence

Name and Address
ASTRAZENECA AB
S-151 85 Södertälje
Sweden

State of Nationality: SE
State of Residence: SE
Telephone No.:
Facsimile No.:
Teleprinter No.:

3. Further observations, if necessary:
Applicants in Box 1. have assigned their rights to applicant in Box 2.

4. A copy of this notification has been sent to:

[X] the receiving Office
[ ] the International Searching Authority
[X] the International Preliminary Examining Authority
[ ] the designated Offices concerned
[X] the elected Offices concerned
[ ] other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer
C. Cupello

Telephone No.: (41-22) 338.83.38

Form PCT/IB/306 (March 1994)

003372590

P. ENT COOPERATION TREA

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)

To:

ASTRAZENECA AB
Intellectual Property, Patents
S-151 85 Södertälje
SUÈDE

Date of mailing (day/month/year)
31 March 2000 (31.03.00)

Applicant's or agent's file reference
D 1920-1 WO

IMPORTANT NOTIFICATION

International application No.
PCT/SE99/00416

International filing date (day/month/year)
16 March 1999 (16.03.99)

1. The following indications appeared on record concerning:

[X] the applicant [ ] the inventor [ ] the agent [ ] the common representative

Name and Address
ASTRA AKTIEBOLAG
S-151 85 Södertälje
Sweden

State of Nationality: SE
State of Residence: SE
Telephone No.:
Facsimile No.:
Teleprinter No.:

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

[ ] the person [X] the name [ ] the address [ ] the nationality [ ] the residence

Name and Address
ASTRAZENECA AB
S-151 85 Södertälje
Sweden

State of Nationality: SE
State of Residence: SE
Telephone No.:
Facsimile No.:
Teleprinter No.:

3. Further observations, if necessary:
Please note that the above change also refers to the name indicated in Box No. IV of the request form.

4. A copy of this notification has been sent to:

[X] the receiving Office
[ ] the International Searching Authority
[X] the International Preliminary Examining Authority
[ ] the designated Offices concerned
[X] the elected Offices concerned
[ ] other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer
A. Karkachi

Telephone No.: (41-22) 338.83.38

Form PCT/IB/306 (March 1994)

003203489

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)

To:

ASTRAZENECA AB
Global Intellectual Property
Patents
S-151 85 Södertälje
SUÈDE

Date of mailing (day/month/year)
16 October 2000 (16.10.00)

Applicant's or agent's file reference
D 1920-1 WO

IMPORTANT NOTIFICATION

International application No.
PCT/SE99/00416

International filing date (day/month/year)
16 March 1999 (16.03.99)

1. The following indications appeared on record concerning:

[ ] the applicant [ ] the inventor [X] the agent [ ] the common representative

Name and Address

ASTRAZENECA AB
Intellectual Property, Patents
S-151 85 Södertälje
Sweden

State of Nationality

State of Residence

Telephone No.
46 8 553 260 00

Facsimile No.
46 8 553 288 20

Teleprinter No.

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

[ ] the person [ ] the name [X] the address [ ] the nationality [ ] the residence

Name and Address

ASTRAZENECA AB
Global Intellectual Property
Patents
S-151 85 Södertälje
Sweden

State of Nationality

State of Residence

Telephone No.
+46 8 553 260 00

Facsimile No.
+46 8 553 288 20

Teleprinter No.

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

[X] the receiving Office
[ ] the International Searching Authority
[ ] the International Preliminary Examining Authority
[ ] the designated Offices concerned
[X] the elected Offices concerned
[ ] other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

Sean Taylor

Telephone No.: (41-22) 338.83.38

PA NT COOPERATION TREA

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)

To:

ASTRAZENECA AB
Global Intellectual Property
Patents
S-151 85 Södertälje
SUÈDE

Date of mailing (day/month/year)
10 April 2001 (10.04.01)

Applicant's or agent's file reference
D 1920-1 WO

IMPORTANT NOTIFICATION

International application No.
PCT/SE99/00416

International filing date (day/month/year)
16 March 1999 (16.03.99)

1. The following indications appeared on record concerning:

[X] the applicant [X] the inventor [ ] the agent [ ] the common representative

Name and Address
ASTRA AKTIEBOLAG
S-151 85 Södertälje
Sweden

State of Nationality: DE
State of Residence: DE
Telephone No.:
Facsimile No.:
Teleprinter No.:

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

[ ] the person [ ] the name [ ] the address [ ] the nationality [ ] the residence

Name and Address
VON SCHUCKMANN, Alfred
Winnekendonker Strasse 52
D-47627 Kevelaer
Germany

State of Nationality: DE
State of Residence: DE
Telephone No.:
Facsimile No.:
Teleprinter No.:

3. Further observations, if necessary:
Applicant indicated in Box 1 has jointly assigned his rights to the applicant indicated in Box 2 who then in turn assigned their rights to ASTRAZENECA AB.

4. A copy of this notification has been sent to:

[X] the receiving Office
[ ] the International Searching Authority
[ ] the International Preliminary Examining Authority
[ ] the designated Offices concerned
[X] the elected Offices concerned
[ ] other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer
F. Baechler

Telephone No.: (41-22) 338.83.38

Form PCT/IB/306 (March 1994)

003957800

RECORD COPY

0500
09646140
5000

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No. PCT/ SE 00/ 00416

International Filing Date 02 -03- 2000

The Swedish Patent Office
PCT International Application

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference *(if desired) (12 characters maximum)* P 00-449 AE

Box No. I TITLE OF INVENTION

METHOD FOR MOUNTING A DRUM AS WELL AS A DRUM AND AN AXLE FOR A BRUSH ROLLER

Box No. II APPLICANT

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

SIB
Svenska Industri Borstar i Västerås AB
Ödhumlegatan 4

S-723 55 VÄSTERÅS
Sweden

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

RECEIVED
FEB-5 2001
TC 3700 MAIL ROOM

State *(that is, country)* of nationality: SE

State *(that is, country)* of residence: SE

This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

EKHOLM, Hans
Jakthundsgatan 103

S-722 46 VÄSTERÅS
Sweden

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality: SE

State *(that is, country)* of residence: SE

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: ☒ agent ☐ common representative

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

L.A. GROTH & Co.KB
Each of KARLSSON Leif, ASKERBERG Fredrik, EMTEDAL, Artur, HOPFGARTEN Nils, JOHANSSON WEBJÖRN Ingmari, KARN Ulf, LINDBLOM Erik J. and WÄRULF Olov
Box 6107
S-102 32 STOCKHOLM, Sweden

Telephone No. +46 - 8 - 729 91 00

Facsimile No. +46 - 8 - 31 67 67

Teleprinter No.

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) *(mark the applicable check-boxes; at least one must be marked)*:

Regional Patent

- [x] **AP** **ARIPO Patent:** GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- [x] **EA** **Eurasian Patent:** AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- [x] **EP** **European Patent:** AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- [x] **OA** **OAPI Patent:** BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT *(if other kind of protection or treatment desired, specify on dotted line)* .....

National Patent *(if other kind of protection or treatment desired, specify on dotted line)*:

- [x] **AE** United Arab Emirates
- [x] **AL** Albania
- [x] **AM** Armenia
- [x] **AT** Austria and utility model
- [x] **AU** Australia
- [x] **AZ** Azerbaijan
- [x] **BA** Bosnia and Herzegovina
- [x] **BB** Barbados
- [x] **BG** Bulgaria
- [x] **BR** Brazil
- [x] **BY** Belarus
- [x] **CA** Canada
- [x] **CH and LI** Switzerland and Liechtenstein
- [x] **CN** China
- [x] **CR** Costa Rica
- [x] **CU** Cuba
- [x] **CZ** Czech Republic and utility model
- [x] **DE** Germany and utility model
- [x] **DK** Denmark and utility model
- [x] **DM** Dominica
- [x] **EE** Estonia and utility model
- [x] **ES** Spain
- [x] **FI** Finland and utility model
- [x] **GB** United Kingdom
- [x] **GD** Grenada
- [x] **GE** Georgia
- [x] **GH** Ghana
- [x] **GM** Gambia
- [x] **HR** Croatia
- [x] **HU** Hungary
- [x] **ID** Indonesia
- [x] **IL** Israel
- [x] **IN** India
- [x] **IS** Iceland
- [x] **JP** Japan
- [x] **KE** Kenya
- [x] **KG** Kyrgyzstan
- [x] **KP** Democratic People's Republic of Korea
- [x] **KR** Republic of Korea
- [x] **KZ** Kazakhstan
- [x] **LC** Saint Lucia
- [x] **LK** Sri Lanka
- [x] **LR** Liberia
- [x] **LS** Lesotho
- [x] **LT** Lithuania
- [x] **LU** Luxembourg
- [x] **LV** Latvia
- [x] **MA** Morocco
- [x] **MD** Republic of Moldova
- [x] **MG** Madagascar
- [x] **MK** The former Yugoslav Republic of Macedonia
- [x] **MN** Mongolia
- [x] **MW** Malawi
- [x] **MX** Mexico
- [x] **NO** Norway
- [x] **NZ** New Zealand
- [x] **PL** Poland
- [x] **PT** Portugal
- [x] **RO** Romania
- [x] **RU** Russian Federation
- [x] **SD** Sudan
- [x] **SE** Sweden
- [x] **SG** Singapore
- [x] **SI** Slovenia
- [x] **SK** Slovakia and utility model
- [x] **SL** Sierra Leone
- [x] **TJ** Tajikistan
- [x] **TM** Turkmenistan
- [x] **TR** Turkey
- [x] **TT** Trinidad and Tobago
- [x] **TZ** United Republic of Tanzania
- [x] **UA** Ukraine
- [x] **UG** Uganda
- [x] **US** United States of America
- [x] **UZ** Uzbekistan
- [x] **VN** Viet Nam
- [x] **YU** Yugoslavia
- [x] **ZA** South Africa
- [x] **ZW** Zimbabwe

Check-boxes reserved for designating States which have become party to the PCT after issuance of this sheet:

- [ ] .....
- [ ] .....

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. *(Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)*

Box No. VI PRIORITY CLAIM ☐ Further priority claims are indicated in the Supplemental Box.

Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is: national application: country	regional application:* regional Office	international application: receiving Office
item (1) 04 March 1999 (04.03.1999)	9900789-0	Sweden		
item (2)				
item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) *(only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office)* identified above as item(s): (1)

** Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.*

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) *(if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used)* : ISA / SE

Request to use results of earlier search; reference to that search *(if an earlier search has been carried out by or requested from the International Searching Authority)*: Date *(day/month/year)* Number Country *(or regional Office)*

Box No. VIII CHECK LIST; LANGUAGE OF FILING

This international application contains the following **number of sheets**:

request	:	3
description (excluding sequence listing part)	:	8
claims	:	2
abstract	:	1
drawings	:	2
sequence listing part of description	:	
Total number of sheets	:	16

This international application is **accompanied** by the item(s) marked below:

1. ☒ fee calculation sheet
2. ☒ separate signed power of attorney
3. ☐ copy of general power of attorney; reference number, if any:
4. ☐ statement explaining lack of signature
5. ☐ priority document(s) identified in Box No. VI as item(s):
6. ☐ translation of international application into (language):
7. ☐ separate indications concerning deposited microorganism or other biological material
8. ☐ nucleotide and/or amino acid sequence listing in computer readable form
9. ☒ other *(specify)*: Copy of Office Action

Figure of the drawings which should accompany the abstract: 2

Language of filing of the international application: Swedish

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

L.A.GROTH & Co.KB

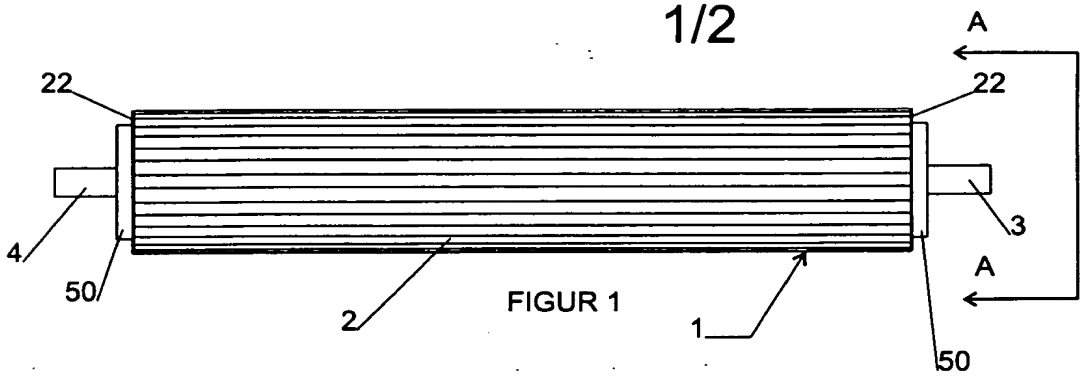
Artur Emtedal

For receiving Office use only

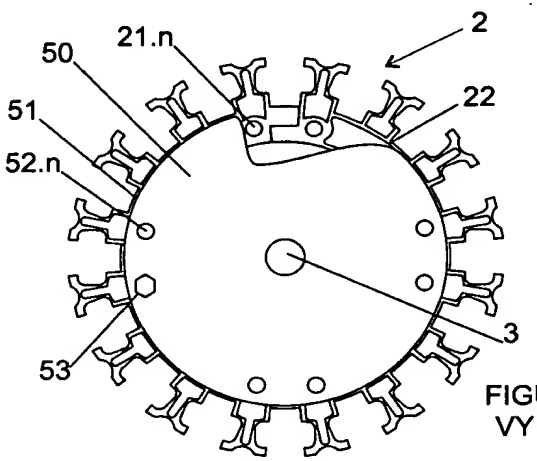
1. Date of actual receipt of the purported international application: 02 -03- 2000
2. Drawings: ☒ received: ☐ not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:
4. Date of timely receipt of the required corrections under PCT Article 11(2):
5. International Searching Authority (if two or more are competent): ISA / SE
6. ☐ Transmittal of search copy delayed until search fee is paid.

For International Bureau use only

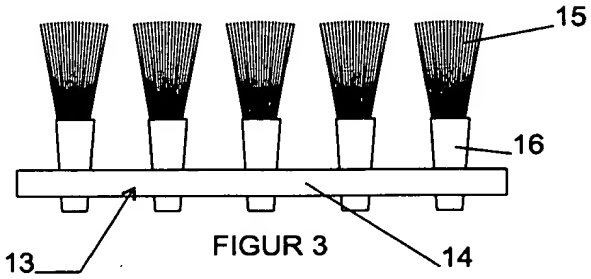
Date of receipt of the record copy by the International Bureau: 26 APRIL 2000 (26.04.00)



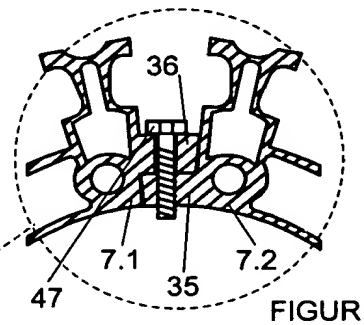
FIGUR 1



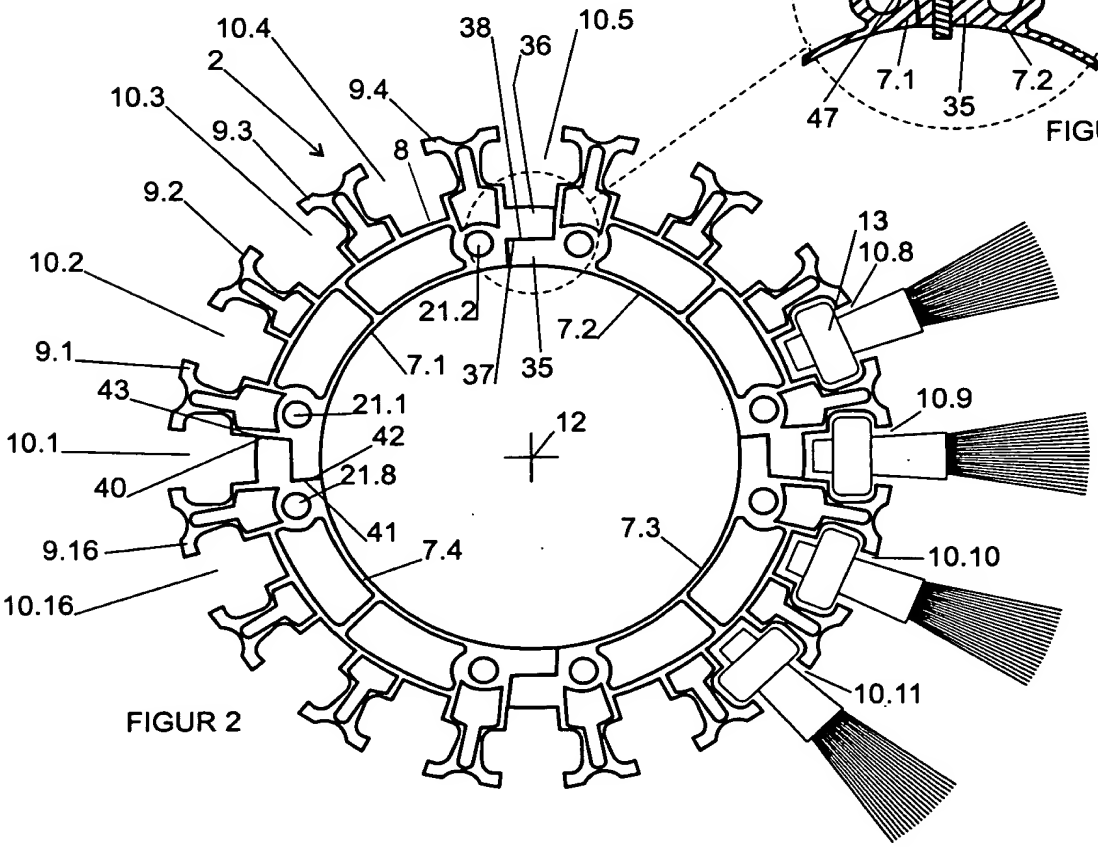
FIGUR 6
VY A-A



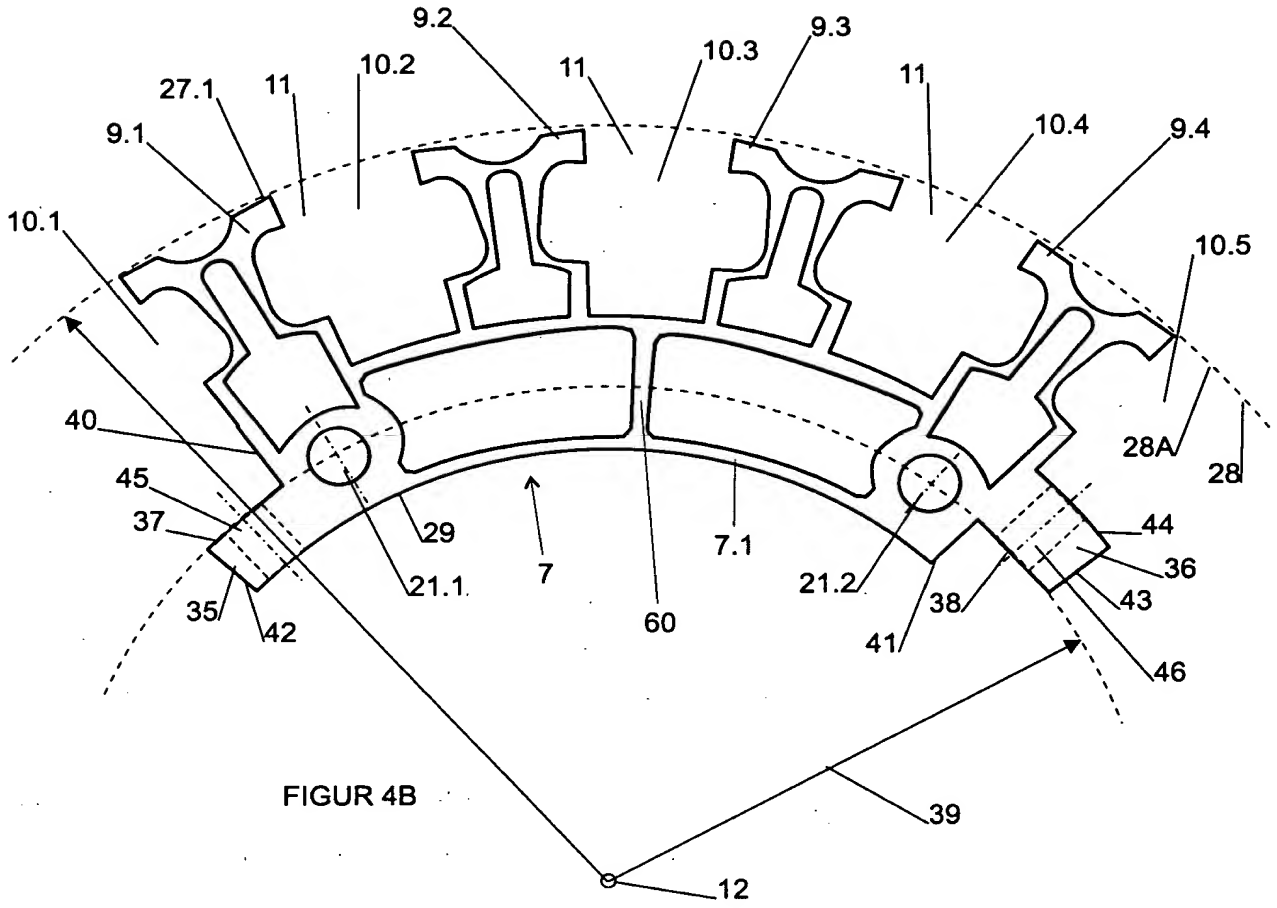
FIGUR 3



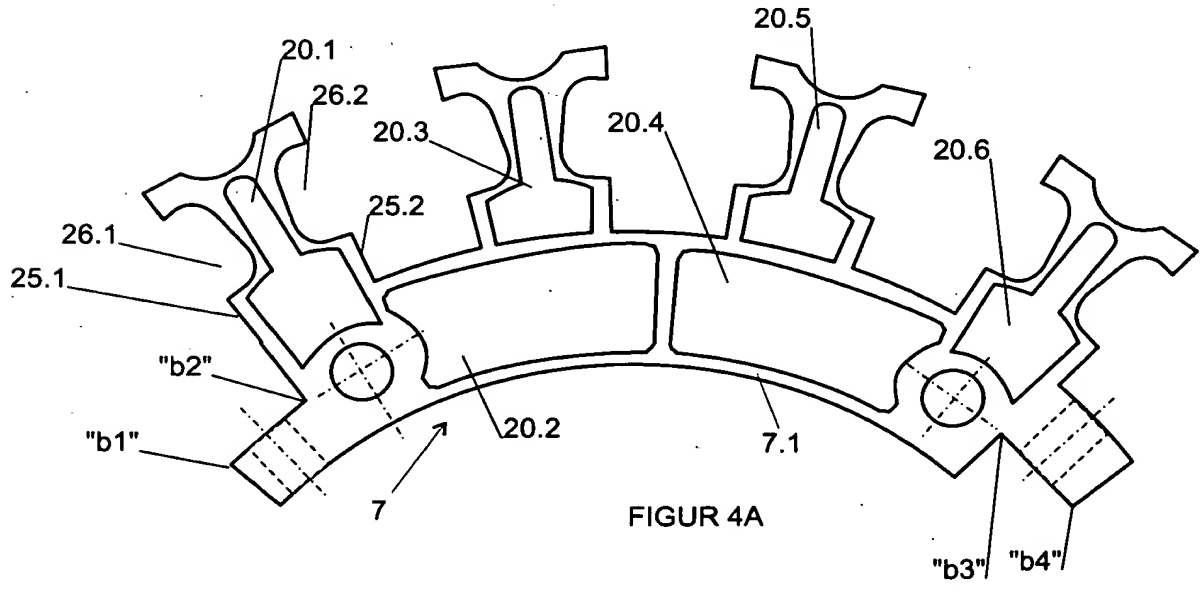
FIGUR 5



FIGUR 2



FIGUR 4B



FIGUR 4A

FÖRFARANDE VID MONTERING AV EN TRUMMA SAMT TRUMMA OCH AXEL TILL EN BORSTVALS

Tekniskt område

Uppfinningen hänför sig till en trumma till en axel i en borstvals. Användningsområdet för en borstvals är för att rengöra stora plana ytor men även för att i industrisammanhang grada, polera eller rugga upp ytor eller kanter.

Uppfinningens bakgrund

Det är välkänt att axlar till borstvalsar, framförallt borstvalsar som nyttjas till sopblåsmaskiner är komplicerade att tillverka. Dessa borstvalsar har i allmänhet en längd inom intervallet 1,5 till 4 meter och diameter inom intervallet 700 till 1800 mm. Därtill roterar borstvalsarna med ett varvtal inom intervallet 400 till 1000 r/m.

Det traditionella sättet att tillverka en borstvals axel är att på ett stålrör eller stålstång fästa axiella hållare vid rörets periferi. I dessa hållare monteras sedan olika utföranden på borstkassetter. Dessa axiella hållare är i allmänhet av strängsprutad aluminium. Ytterligare komponenter som ingår i en sådan borstvals är olika former av kilförband och distanser. Stålröret och distansen svetsas ihop med känd precision. Vid stålröret borras och gängas ett stort antal hål för fästbult. Denna uppsjö av komponenter medför stora lagringskostnad för material liksom dyrbara bearbetningskostnader.

Alternativ som finns på marknaden är att utforma borstvalsens axel som en helt strängsprutad aluminiumprofil. Ett problem är att matrisen som nyttjas vid strängsprutningen har begränsningar i storlek varvid endast vissa maximala diametrar kan tillverkas. Vidare blir dessa strängsprutade aluminiumprofiler mycket tunga vid grova godstjocklekar. Någon reduktion av dess massa genom att lägga in håligheter är ej möjlig. En stor nackdel vid strängsprutning av aluminiumprofiler är den bananform som profilen får på kylbädden. En profil på 4 meters längd kan ha en krokighet på 4 mm eller mer. Denna krokighet medför ett merarbete vid den dynamiska balanseringen.

Vidare är det tidigare känt genom US 3,134,123 och US 3,862,463 att utforma borstvalsens cylinderformiga axel i segment vilka sammanfogas och förankras vid i axelns ändar centralt belägna navorgan. Segmenten är utförda såsom tunnväggiga sektioner vilka inte är uppstyvade i axiell led vilket innebär att axeln är

begränsad till både längd och till diameter. Med detta sätt att utforma en borstvals axel är det inte möjligt att tillverka långa axlar, exv. 4 m, och inte heller axlar med stor diameter, exv. 1200 mm, p.g.a. de uppträdande obalanserna vid dessa aktuella varvtal. I US 3,134,123 indikeras vidare att utföringsexemplet enligt figur 3 utgör en självbärande konstruktion. Emellertid är denna konstruktion ytterligt kostnadskrävande p.g.a. att sektionernas laxstjärtsformade sammanfogningar inte är möjliga att tillverka utan efterbearbetning, med de toleranser som krävs för att förbanden skall vara glappfria. Dessutom måste laxstjärtformen enligt US 3,134,123 vara utformad med ett visst spel för att en sektion skall kunna axiellt skjutas in i en annan sektion vilket i sig innebär glapp i konstruktionen.

Uppfinningens syfte

Ändamålet med uppfinningen är att lösa ovannämnda problem och att förbättra en trumma i en borstvals axel så att axeln blir enklare att tillverka därtill till lägre kostnad samt att den blir lättare vilket bidrar till att öka stabiliteten vid lagerhusen för axeln.

Vidare är ändamålet med uppfinningen att åstadkomma en trumma till en borstvals axel vilken trumma under dynamisk belastning uppträder såsom en stel cylinder.

Dessutom är syftet med uppfinningen att åstadkomma en trumma till en borstvals med förhållande stor diameter och längd som kan tillverkas av strängsprutade aluminiumsektioner och som efter sammanfogning uppträder helt utan glapp och med en styvhet som motsvarar en homogen kropp, exv. en cylinder.

Sammanfattning av uppfinningen

Genom föreliggande uppfinning såsom den framgår av patentkraven uppfylls angivna syften varvid ovan nämnda nackdelar har eliminerats.

Förfarande vid ihopmontering av en trumma, enligt uppfinningstanken, är att trumman ingår såsom del i en axel samt att axeln utgör en del av en borstvals. Det som kännetecknar monteringen är att en axel består av en trumma på vilken har monterats en ändskiva med två axeltappar.

Trumman har företrädesvis ett cirkelformat tvärsnitt. Vid trummans periferi finns anordnade ett flertal axiella, företrädesvis U- formade spår. En normal axel har 16 stycken spår, men antalet spår kan uppgå till såväl flera som färre.

Trumman tillverkas företrädesvis av fyra stycken segment av strängsprutade aluminiumprofiler.

Antalet segment begränsas på intet sätt till dessa fyra segment utan kan i antal vara från två eller flera, ex 2, 4 6 8 stycken. Företrädesvis nyttjas jämt antal profiler, för att på enklast sätt uppnå dynamisk balans, vid rotation. Segmenten uppvisar en yttre bågform. Exempelvis monteras fyra stycken segment ihop till en trumma. Varje segment har ett första kantparti med en första klack och ett andra kantparti med en andra klack.

Vid ihopmontering av fyra segmentprofiler till en trumma sker det på följande sätt.

I ett första steg anordnas varje segment så att den första klackens och/eller den andra klackens kantparti är i anliggning mot ett närliggande segments andra respektive första anliggningsyta. Detta förfarande medför att trumman alltid erhåller samma diameter. Om en spalt förekommer mellan de olika segmentet finns risk för obalans. Anliggningsytorna mellan segmentens klackar är plana för att erhålla största möjliga kontaktyta utan att behöva bearbeta ytorna. Alternativt kan klackarnas anliggningsytor vara försedda med tapp och spår för att i större utsträckning ta upp tangentiella skjuvspänningar mellan segmenten.

En variant på segmentens form är att anordna två närliggande segment med ett första segments andra klacks undersida i anliggning mot ett andra segments första klacks första översida.

Detta förfarande görs när segmentens båda klackar sitter på olika höjd, dvs. radiellt avstånd från axelns rotationscentrum. Ett alternativt utförande är att två olika former på segment nyttjas och där vartannat segment har lika form, dvs klackarna sitter på vartannat segment på lika radiellt avstånd från den inre bågen.

Ytterligare en faktor är att varje profil är krum vid strängsprutningen. Genom att dela upp trumman i segment så kommer segmentets krumhet att kompenseras och trumman bli rak. Vid ett och samma strängsprutningstillfälle kommer varje stång att kylas av på likartat sätt och få var och en likartade defekter.

Ett andra steg innebär att genomgående hål borras eller borras och gängas, i radiell riktning, exv. genom den första yttersta klacken som ett frigångshål och genom den andra innersta klacken som ett gängat hål i varje segment. Längs segmenten i varje klack borras två eller flera hål på lika eller olika avstånd från varandra.

Det tredje steget medför att ett fästelement, bult alternativt skruv och mutter, bringas genom varje hål. Genom detta skruvförband erhålls fullständig glappfrihet vilket krävs om en borstvals på 2,5 – 6,0 meters längd skall kunna balanseras dynamiskt och därefter klara ett kontinuerligt varvtal på upp till 1200 varv/min.

Vid montering av trumman till axel så monteras vid trummans ändpartier en cirkelformad skiva med en koncentriskt anordnad axeltapp. Kongruens föreligger mellan varje eller vartannat segment som ingår i en trumma. Fördelen med att endast nyttja en form på segment i trumman är att spara kostnader.

De segment som ingår i en trumma uppvisar följande kännetecken;

- segmenten utgöras av strängsprutade aluminiumprofiler;
- ett segment uppvisar en yttre bågform;
- varje aluminiumprofil uppvisar vid ovansidan två eller flera företrädesvis fyra stycken radiellt utskjutande balkar;
- mellan två närliggande barkar uppvisas ett U-format spår;
- varje segment uppvisar en första klack och en andra klack;

I ett utförande uppvisar ett segment att den första klackens ovansida och den andra klackens undersida exponerar företrädesvis en plan yta.

Segmenten är dessutom utförda dubbelväggiga varvid ett eller flera hålrum bildas i varje segment. I ett segment med två hålrum separeras hålrummen av radiellt uppstyvande distanser vilka sträcker sig axiellt längs hela segmentets längd. Segmentens U-formade spår är vidare radiellt belägna i förhållande till trummans tänkta centrumaxel.

Kort beskrivning av ritningarna

En utförandeform av uppfinningen visas schematiskt i bifogade ritningar där:

Figur 1	uppvisar en axel med dess trumma och två axeltappar.
Figur 2	uppvisar ett ändparti av en trumma, därtill visas ett antal borstkassetter inskjutna i spår.
Figur 3	uppvisar ett utförande på borstkassett.
Figur 4 A-B	uppvisar ett segment.
Figur 5	visar ett snitt ur figur 3 genom en skarv mellan två segment

visande hål med bult.

Figur 6 visar en vy A - A ur figur 1 av ett ändparti av en axel till en borstvals.

Beskrivning av uppfinningen

I figur 1 förevisas en axel 1, sedd framifrån, som är uppbyggd av en trumma 2 och två stycken axeltappar 3, 4. Varje axeltapp 3, 4, ev. utformad som en del i ett splines-förband, är monterad på en momentöverförande skiva 50 som i sin tur täcker trummans 2 ändparti 22. Två axeltappar 3,4 med varsin skiva 50 tillsammans med en trumma 2 utgör axeln 1 till en borstvals.

I figur 2 uppvisas ett ändparti av trumman 2 varvid trumman 2 innefattar i detta utföringsexempel fyra segment 7.1, 7.2, 7.3, 7.4. Trumman 2 bildas av de fyra segmenten . 7.1, 7.2, 7.3, 7.4 ihopmonterade. Segmenten 7.1, 7.2, 7.3, 7.4 är tillverkade av en strängsprutad aluminiumprofil. Varje segment 7.1, 7.2, 7.3, 7.4 uppvisar vid dess ovansida 8 fyra stycken radiellt utskjutande balkar 9.1, 9.2, 9.3, 9.4. Varje segment 7.1, 7.2, 7.3, 7.4 är, för att minska tillverkningskostnaden, kongruenta med varandra.

I en, av fyra segment 7.1, 7.2, 7.3, 7.4 ihopmonterad trumma 2, uppvisas sexton stycken U- formade spår 10.1..... 10.16 så anordnade att mellan två närliggande balkar 9.1, 9.2 uppvisas ett U- format spår 10.2. På samma sätt är spåren 10.1,... 10.16 anordnade mellan de övriga närliggande balkarna 9.1,..9.16. I de U-formade spåren 10.8 ... 10.11 visas monterade rader av borstkassetter 13 i vilka borstar är monterade. Vidare är åtta runda gängade hål 21.1, ... 21.8 avsedda att användas vid montering av skivan 50 med dess axeltappar 3, 4 till trummans 2 ändparti 22 anordnade axiellt in i varje segment, företrädesvis i området under en balk i anslutning till segmentens ändar. Trumman är anordnad att rotera kring sitt centrum 12.

I figur 3 förevisas ett utförande av en borstkassett 13 som innefattar en hållare 14 för fem borstar med borsttråd 15 vilka är inpressade i en duska 16.

Figurerna 4 A och 4 B visar ett enskilt segment 7.1 med dess strängsprutade aluminiumprofil 7 sedd från dess ändparti. Vid strängsprutning av en aluminiumprofil 7 genom en matris, kommer alla hål i matrisen ge aluminiumprofilen 7 en långsträckt form. Hålbilden i en matris överensstämmer med profilens tvärsnitt. För att minska kostnaden, vid tillverkning, liksom vikten samt öka profilens 7 styvhet

uppvisar profilen ett antal hålrum 20.1 - 20.6 varav fyra är belägna i balkarna 9.1,..9.4, och två i profilen 7. De två hålrummen 20.2, 20.4 i profilen är bildade genom att profilen är dubbelväggig samt att hålrummen separeras av radiellt uppstyvande distanser 60 vilka sträcker sig axiellt längs hela segmentets längd. Därtill kommer i detta exempel de två stycken runda gängade hålen 21.1, 21.2 som är avsedda användas vid montering av skivan 50 med dess axeltappar 3, 4 till trummans 2 ändparti 22, se fig. 1. Varje balk 9.1 ..9.4 i segmentet 7.1 uppvisar ett första sidoparti 25.1 och ett andra sidoparti 25.2 med var sitt längsgående spår 26.1, 26.2. Varje spår 26.1, 26.2, vid varje balk 9.1..9.4, uppvisar samma avstånd till trummans centrumpunkt 12. Spåren 26.1, 26.2 har sin öppning mot det U- formade spåret 10.1 ... 10.16. De U- formade spåren 10.1 ... 10.16 har sin öppning 11 i riktning från trummans 2 centrum 12.

Balkarnas 9.1, 9.2, när segmenten 7.1..7.4 är monterade som en trumma 2, utåtvända yta 27.1, ... 27.16 tangerar en omskriven cirkel 28. Varje segment 7.1, 7.2, 7.3, 7.4 uppvis en yttre bågform 28A. Ett segment 7.1 uppvisar, i detta exempel, en inåtvänd yta 29 vilken även den uppvisar en bågform. Såväl den omskrivna cirkeln 28 som den inåtvända bågformade ytan 29 har samma radiella centrumpunkt 12. På profilen 7, tangentiellt utanför den första balken 9.1, är en första klack 35 anordnad liksom det på profilen är anordnat en andra klack 36 tangentiellt utanför den fjärde balken 9.4. Den första klackens 35 ovansida 37 liksom den andra klackens 36 undersida 38 uppvisar företrädesvis en plan yta, men kan även anta en bågform med en gemensamma radie 39. Radien 39 har sitt centrum i trummans centrum 12. Bredden "b1 - b2", dvs. avståndet från det invändiga hörnet b2 mellan klackens 35 ovansida 37 och en första radiell anliggningsyta 40 på den första balken 9.1 till klackens 35 utvändiga hörn b1, är företrädesvis lika stor som bredden "b3 -b4", dvs. avståndet från det invändiga hörnet b3 mellan den andra klackens undersida 38 och en andra radiell anliggningsyta 41 under den fjärde balken 9.4. till klackens 36 utvändiga hörn b4.

Således benämnes vid den första klackens 35 ovansida 37 det företrädesvis radiellt uppåtriktade partiets utsida, en första anliggningsyta 40.
Vid den andra klackens 36 undersida 38 benämnes på motsvarande sätt det företrädesvis radiellt nedåtriktade partiets utsida, en andra anläggningsyta 41.

Den första klacken 35 uppvisar ett första kantparti 42. Detta kantparti 42 sträcker sig från klackens 35 undersida 29 till dess översida 37. Den andra klack-

en 36 uppvisar ett andra kantparti 43 som sträcker sig från klackens 36 undersida 38 till klackens 36 översida 44.

Montering av trumman 2 tillgår på följande sätt:

a) fyra stycken segment 7.1, 7.2, 7.3, 7.4, figur 4A, 4B, anordnas vid varandra enligt figur 2 på så sätt att en segments 7.1, 7.2, 7.3, 7.4, första klacks 35 översida 37 bringas i anliggning mot en andra klacks 36 undersida 38;

b) varje segments 7.1, 7.2, 7.3, 7.4, första klack 35 och, dess första kantparti 42 bringas till anliggning mot näraliggande segments 7.1, ... 7.4 andra anliggningsyta 41, se fig. 2;

c) varje segments 7.1, 7.2, 7.3, 7.4, andra klack 36 och dess andra kantparti 43 bringas till anliggning mot näraliggande segments första anliggningsyta 40, se fig. 2;

d) alternativ till b/ och c/ är att endera ett första kantparti 42 är i anliggning mot en andra anliggningsytan 41 eller att ett andra kantparti 43 är i anliggning mot en första anliggningsyta 40;

e) i radiell riktning borras och gängas hål 45, 46, figur 4A, 4B, genom varje första 35 och andra klack 36;

f) ett flertal hål 45, 46 borras på lika eller olika axiellt avstånd från varandra;

g) genom varje hål 45, 46 anordnas ett fästelement 47 fig. 5, bult, på sådant sätt att mellan klackarna 35, 36 vid anliggningsytan 37, 38 erhålls ett friktionsförband.

Figur 5 visar ett snitt genom en skarv i fig. 2 mellan två närliggande segment 7.1, 7.2. Snittet visar att segmenten monterats ihop med ett skruvförband varvid ena segmentets 7.1 andra klack 36 uppvisar ett genomgående hål radiellt i linje med ett gängat hål genom det andra segmentets 7.2 första klack 35. Genom dessa hål är fästelementet 47, i form av en bult, dvs. maskinskruv, inskruvad. Härvid pressas de plana anliggningsytorna 37, 38 mot varandra, se fig. 2. Även klackens 36 översida 44 är plan för att erhålla bästa möjliga anliggningsyta för fästelementet 47.

I figur 6 visas en vy A-A från figur 1 med en del av skivan 50 bortskuren. Figuren visar axelns 1 ände med dess axeltapp 3 koncentriskt anordnad vid skivan 50. Vid skivans 50 periferi 51 är anordnad hål 52.n, där n=1,.....,8, för ett andra fästelement 53 i form av en axiellt monterad bult. Avståndet mellan hålen 52.1 ...

52.8 överensstämmer med avstånden mellan de gängade hålen 21.n, där n=1,.....,8, vid trummans 2 ändparti 22.

Montering av skivorna 50 med dess axeltappar 3, 4 till trumma 2 tillgår på följande sätt;

a) vid trummans 2 respektive ändpartier 22 anordnas en axeltapp 3, 4 med dess momentöverförande skiva 50;

b) axeltapparna 3,4 med skiva 50, anordnas koncentriskt vid trummans 2 ändparti 22;

c) genom hålen 52.1,..... 52.8 i varje skiva 50 skruvas fästelementet 53 därigenom och in i de hål 21.1 ... 21.8 som finns vid trummans 2 ändparti 22.

Uppfinningen begränsas ej till det beskrivna exemplet, utan uppfinningen kan nyttjas i alla segmentuppbyggda trummor som nyttjas som del i en axel där varje segment är i form av en strängsprutad profil och där varje segment uppvisar två stycken klackar vilka sammanbinds med ett fästelement. Uppfinningen är ej begränsad till ett visst antal segment utan till alla segment som uppgår till två eller flera. Uppfinningen är inte heller i dess vidaste omfång begränsad till att trumman skall anta formen av en cylinder utan kan även anta formen av en liksidig polygon.

PATENTKRAV

1. Förfarande vid ihopmontering av en av segment (7.1, ... 7.4) uppbyggd trumma (2) som ingår såsom del i en axel (1) till en borstvals, **kännetecknat** av

a) att varje segment (7.1, ... 7.4) bringas till anliggning genom att en första klack (35) och/eller en andra klacks (36) kantparti (42, resp 43) bringas till anliggning mot ett närliggande segments (7.1,..7.4) andra (41) respektive första (40) anliggningsyta;

b) att genomgående hål (45, 46) borras, i radiell riktning, genom en första (35) och en andra klack (36) i varje segment (7.1,...7.4) varvid ett av hålen dessutom gängas;

c) att vid varje klack borras två (45, 46) eller flera hål (45, 46) i axiell led på lika eller olika avstånd från varandra;

d) att ett fästelement (47) anordnas vid varje hål (45, 46).

2. Förfarande enligt krav 1, **kännetecknat** av att vid trummans (2) vardera ändparti (22) anordnas en skiva (50) med en axeltapp (3,4).

3. Trumma (2) till en borstvals, vilken trumma (2) är uppbyggd av åtminstone två segment (7.1, ... 7.4) vilka vart och ett är vid dess ovansida (8) försedda med två eller flera, företrädesvis fyra stycken, utskjutande balkar (9.1, ... 9.4) varvid mellan två närliggande balkar (9.1, 9.2) är anordnat ett U-format spår (10.2) varvid trumman (2). är anordnad att rotera kring sitt centrum (12) genom att det till trumman (2) är anslutet momentöverförande organ (50), **kännetecknad** av att varje segment (7.1, ... 7.4) i trumman (2) är dubbelväggigt utformat med en styvhet som är tillräcklig för att segmenten (7.1, ... 7.4) hopmonterade bildar en helt självbärande trumma (2).

4. Trumma enligt kravet 3, **kännetecknad** av att varje segment (7.1, ... 7.4) är utformat med mellan de dubbla väggarna uppstyvande distanser (60).

5. Trumma enligt något av kraven 3-4, **kännetecknad** av att kongruens föreligger mellan åtminstone två i trumman (2) ingående segment (7.1, ... 7.4).

6. Trumma enligt något av kraven 3-5, **kännetecknad** av att segmenten (7.1, ... 7.4) uppvisar en yttre bågform (28A).

7. Trumma enligt något av kraven 3-6, **kännetecknad** av att varje segment (7.1, ... 7.4) uppvisar, i tvärsnitt, ett första kantparti (42) med en första klack (35) och ett andra kantparti (43) med en andra klack (36) varvid den första klackens (35) ovansida (37) och den andra klackens (36) undersida (38) uppvisar en plan yta.

8. Trumma enligt kravet 7, **kännetecknad** av att mellan två närliggande segment (7.1, 7.2) är ett första segments (7.1) andra klacks (36) undersidas (38) plana yta i anliggning mot ett andra segments (7.2) första klacks (35) översidas (37) plana yta.

9. Trumma enligt något av kraven 3-8, **kännetecknad** av att segmenten (7.1, ... 7.4) utgöras av strängsprutade aluminiumprofiler (7.1, ... 7.4).

10. Trumma enligt något av kraven 3-9, **kännetecknad** av att antalet segment (7.1.... 7.4) i trumman (2) är ett jämt antal, exempelvis 2, 4, 6 eller 8 stycken.

11. Trumma enligt något av kraven 3-10, **kännetecknad** av att trumman (2) i sig själv utgöras av två eller flera, företrädesvis fyra stycken, lika långa, långsträckta segment (7.1 ... 7.4) av strängsprutade profiler (7.1 ... 7.4) varvid varje segment (7.1 ... 7.4) uppvisar en yttre bågform (28A).

12. Axel (1) till en borstvals, **kännetecknad** av att axeln (1) består av en trumma (2) enligt något av kraven 3-11 som är anordnad mellan två axeltappar (3,4) varvid varje axeltapp (3, 5) är ansluten till en momentöverförande skiva (50) koncentriskt anordnad i förhållande till och ansluten till trummans (2) ändparti (22).

SAMMANDRAG

Förfarande vid ihopmontering av en segmentuppbyggd trumma (2) som ingår såsom del i en axel (1) till en borstvals varvid;

a) varje segment (7.1, ... 7.4) bringas till anliggning genom att en första klack (35) och/eller en andra klacks (36) kantparti (42, resp 43) bringas till anliggning mot ett närliggande segments (7.1,..7.4) andra (41) respektive första (40) anliggningsyta;

b) att genomgående hål (45, 46) borras, i radiell riktning, genom en första (35) och en andra klack (36) i varje segment (7.1,...7.4) varvid ett av hålen dessutom gängas;

c) att vid varje klack borras två (45, 46) eller flera hål (45, 46) i axiell led på lika eller olika avstånd från varandra;

d) att ett fästelement (47) anordnas vid varje hål (45, 46).

Vidare anger uppfinningen en trumma (2) till en borstvals, vilken trumma (2) är uppbyggd av åtminstone två segment (7.1, ... 7.4) vilka vart och ett är vid dess ovansida (8) försedda med två eller flera, företrädesvis fyra stycken, radiellt utskjutande balkar (9.1, ... 9.4) varvid mellan två närliggande balkar (9.1, 9.2) är anordnat ett U-format spår (10.2) varvid trumman (2). är anordnad att rotera kring sitt centrum (12) genom att det till trumman (2) är anslutet momentöverförande organ (50) varvid varje segment (7.1, ... 7.4) i trumman (2) är dubbelväggigt utformat med en styvhet som är tillräcklig för att segmenten (7.1, ... 7.4) hopmonterade bildar en helt självbärande trumma (2).

Dessutom anger uppfinningen en axel (1) till en borstvals varvid axeln (1) består av en trumma (2) enligt ovan som är anordnad mellan två axeltappar (3,4) varvid varje axeltapp (3, 5) är ansluten till en momentöverförande skiva (50) koncentriskt anordnad i förhållande till och ansluten till trummans (2) ändparti (22).

15

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
D 1920-1 WO		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/SE99/00416	16.03.1999	17.03.1998
International Patent Classification (IPC) or national classification and IPC7		
A 61 J 1/03, A 61 M 15/00, B 65 D 75/36		
Applicant		
AstraZeneca AB et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
12.10.1999	29.06.2000
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Telex 17978 PATOREG-S Facsimile No. 08-667 72 88	Authorized officer Rune Bengtsson/Els Telephone No. 08-782 25 00

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/SE99/00416

I. Basis of the report

1. This report has been drawn on the basis of *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.)*:

☐ the international application as originally filed.

☒ the description, pages 1-18 , as originally filed,
pages _____ , filed with the demand,
pages _____ , filed with the letter of _____ ,
pages _____ , filed with the letter of _____ .

☒ the claims, Nos. _____ , as originally filed,
Nos. _____ , as amended under Article 19,
Nos. _____ , filed with the demand,
Nos. 1-18 , filed with the letter of 18.04.2000 ,
Nos. _____ , filed with the letter of _____ .

☒ the drawings, ~~sheets~~/fig 1-14b , as originally filed,
~~sheets~~/fig _____ , filed with the demand
~~sheets~~/fig _____ , filed with the letter of _____ ,
~~sheets~~/fig _____ , filed with the letter of _____ .

2. The amendments have resulted in the cancellation of:

☐ the description, pages _____
☐ the claims, Nos. _____
☐ the drawings, ~~sheets~~/fig _____

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the supplemental Box (Rule 70.2(c)).

4. Additional observations, if necessary:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/SE99/00416

V. Resoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-18	YES
	Claims		NO
Inventive step (IS)	Claims	1-18	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-18	YES
	Claims		NO

2. Citations and explanations

The invention relates to a blister pack unit for a powder inhaler.

The aim of the invention is to get a smaller blister pack unit with the same amount of doses. This is achieved by using two blister packs positioned like a cogwheel. The powder is inhaled by puncturing the blisters with a suction pipe.

Documents cited in the International Search Report:

D1 : DE 44 29 503, A1
D2 : WO 97 40 876, A2

D1 is the closest prior art of the invention and describes a two-piece blister pack assembly. One part has a plurality of blisters, each containing powder. It is rotationally disposed about an imaginary axis. The other part supports the first part. See especially the figures and the abstract.

The invention according to the new set of claims 1 to 18 describes a compact device, which has a substantially reduced volume. This is achieved by staggering the blisters in adjacent rows in each of the first and second surfaces, which is not the case in the cited document D1. In D1 the blister strips in a row in the upper blister strip sit between adjacent rows of blisters in the lower blister strip. This placement of the strips does not minimise the overall volume of the package for a given number of blisters.

.../...

Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: V

D2 describes an appliance for inhalation of a powder from a package, and especially a powder medication.

The invention according to the new set of claims 1 to 18 makes use of two blister packs, which is not the case in the cited document D2.

The invention, according to the claims 1 to 18, is novel (N), is considered to involve an inventive step (IS) and is considered to have industrial applicability (IA).

[AstraZeneca reference D 1920-1WO]

CLAIMS:

1. A blister pack element for a powder inhaler comprising a body which includes first and second surfaces which are substantially parallel to each other, the first and second surfaces having a plurality of blisters (21,22) containing medicament, wherein the blisters in the first and second surfaces are arranged in rows running parallel to the longitudinal axis of the blister pack element and the blisters in each row in the first surface are configured to sit between the blisters in a co-operating row in the second surface, the blisters in the first and second surfaces being rotationally symmetrically disposed about the longitudinal axis of the blister pack element.

2. A blister pack element for a powder inhaler as claimed in Claim 1, wherein the blisters in one row of a surface are off-set/staggered with respect to the blisters in an adjacent row of that surface.

3. A blister pack element as claimed in Claim 1 or Claim 2, wherein the blisters (21,22) in the first and second surfaces are configured such that the blisters (21) in the first surface are disposed in one or both of spaces between and adjacent the blisters (22) in the second surface.

4. A blister pack element as claimed in any of Claims 1 to 3, wherein the plurality of surfaces are defined by separate elements (11,12).

5. A blister pack element as claimed in any of Claims 1 to 3, wherein the plurality of surfaces are defined by a single element.

6. A blister pack unit (5) comprising the blister pack element in any of Claims 1 to 5, and a support member (10) which supports the plurality of surfaces.

7. A blister pack unit (5) as claimed in Claim 6, wherein the support member (10) comprises a frame (13).

8. A blister pack assembly (3) comprising the blister pack unit (5) of Claims 6 or Claim 7 and a suction tube (7) which includes a cutting assembly (64) which is configured for insertion into a respective one of the blisters (21,22) and an inhalation channel (71) through which powder is in use inhaled.

9. The blister pack assembly (3) of Claim 8, wherein the body includes a clip (14) for holding the suction tube (7) when not in use.

10. The blister pack assembly of Claim 8 or Claim 9, further comprising an interconnecting member (9) for connecting the suction tube (7) to the blister pack unit (5) so as to prevent the suction tube (7) from being separated from the blister pack unit (5).

11. The blister pack assembly of Claim 10, wherein the interconnecting member (9) includes a line (76).

12. The blister pack assembly of Claim 10 or 11, wherein the body of the blister pack unit (5) includes a track and the interconnecting member (9) includes an element (79) which is captively disposed within the track and moveable between the first and second positions.

13. The blister pack assembly of Claim 12, wherein the track is configured such that with the element (76) of the interconnecting member (9) in one of the first

and second positions the interconnecting member (9) is disposed substantially within the track.

14. A powder inhaler comprising the blister pack unit (5) of Claim 6 or Claim 7.

15. A powder inhaler comprising the blister pack assembly (3) of any of Claims 8 to 13.

16. The powder inhaler of Claim 15, further comprising a support unit (1) for supporting the blister pack assembly (3), which support unit (1) includes a plurality of openings (87) for guiding the suction tube (7) into respective blisters (21,22) in the one of the plurality of surfaces adjacent thereto.

17. The powder inhaler of Claim 16, wherein the support unit (1) comprises a housing (81) in which the body of the blister pack unit (5) is removably received, with at least one wall (85) of the housing (81) including the openings (87).

18. The powder inhaler of Claim 17, wherein the support unit (1) further comprises a cover member (84) which is hingeably mounted to the housing (81) and encloses the suction tube (7) and the openings (87) when closed.

09/646148

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
A61J 1/03, A61M 15/00, B65D 75/36

A1

(11) International Publication Number: **WO 99/47099**

(43) International Publication Date: 23 September 1999 (23.09.99)

(21) International Application Number: PCT/SE99/00416

(22) International Filing Date: 16 March 1999 (16.03.99)

(30) Priority Data:
9800897-2 17 March 1998 (17.03.98) SE

(71) Applicant *(for all designated States except US)*: ASTRA AKTIEBOLAG [SE/SE]; S-151 85 Södertälje (SE).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: HECKENMÜLLER, Harald [DE/DE]; Astra GmbH, D-22876 Wedel (DE). HETZER, Ulrich [DE/DE]; Astra GmbH, D-22876 Wedel (DE). KUBLIK, Heike [DE/DE]; Astra GmbH, D-22876 Wedel (DE). VON SCHUCKMANN, Alfred [DE/DE]; Winnekendonker Strasse 52, D-47627 Kevelaer (DE). TIEDEMANN, Volker [DE/DE]; Astra GmbH, D-22876 Wedel (DE).

(74) Agent: ASTRA AKTIEBOLAG; Intellectual Property, Patents, S-151 85 Södertälje (SE).

(81) Designated States: AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published

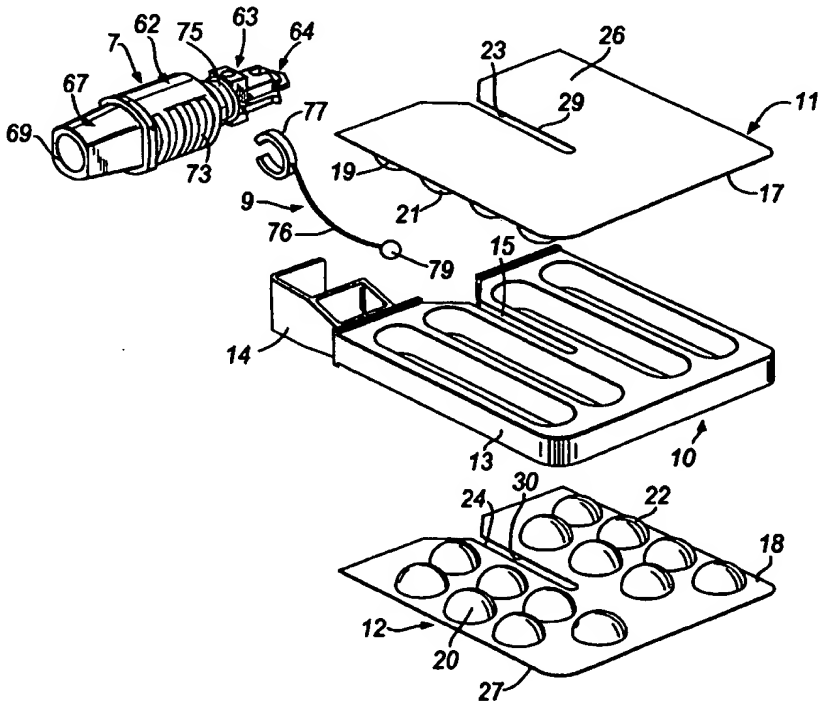
With international search report.

Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: INHALATION DEVICE

(57) Abstract

A blister pack unit for a powder inhaler, comprising a body which includes a plurality of surfaces which each includes a plurality of blisters (21, 22) containing powder containing medicament and are rotationally symmetrically disposed about an imaginary axis.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

INHALATION DEVICE

The present invention relates to a blister pack unit for an inhaler for administering dry powder by inhalation, a blister pack assembly comprising the same and an inhaler comprising the same.

It is known in the treatment of respiratory conditions, such as asthma, to provide certain medicaments in the form of a dry powder for inhalation. It is also known to provide individual doses of such powders in the blisters of a blister pack element.

WO-A-97/40876 discloses a powder inhaler for administering dry powder which comprises a support unit for supporting a blister pack element which includes a plurality of blisters, with each blister containing a dose of powder containing medicament, and a suction tube which is configured so as to be insertable into a respective one of the blisters and through which a dose of powder is in use drawn on inhalation by a user.

Whilst this known powder inhaler functions perfectly adequately, it is an aim of the present invention to provide a blister pack unit for a powder inhaler, which, for the same number of doses, is of smaller dimension and hence provide a powder inhaler of smaller dimension.

Accordingly, the present invention provides a blister pack unit for a powder inhaler, comprising a body which includes a plurality of surfaces which each include a plurality of blisters containing powder containing medicament and are rotationally symmetrically disposed about an imaginary axis.

In a preferred embodiment the imaginary axis is an axis through the body.

Preferably, the body includes a support member which supports the plurality of surfaces.

More preferably, the support member comprises a frame.

Preferably, the body includes first and second oppositely-directed surfaces.

More preferably, the first and second surfaces are substantially parallel.

Preferably, the blisters in the first and second surfaces are configured such that the blisters in the first surface are disposed in one or both of spaces between and adjacent the blisters in the second surface.

In one embodiment the plurality of surfaces are defined by separate elements.

In another embodiment the plurality of surfaces are defined by a single element.

The present invention also provides a powder inhaler which comprises the above-described blister pack unit.

The present invention further provides a blister pack assembly which comprises the above-described blister pack unit and a suction tube which includes a cutting assembly which is configured for insertion into a respective one of the blisters and an inhalation channel through which powder is in use inhaled.

Preferably, the body of the blister pack unit includes a clip for holding the suction tube when not in use.

Preferably, the blister pack assembly further comprises an interconnecting member for connecting the suction tube to the blister pack unit so as to prevent the suction tube from being separated from the blister pack unit.

In a preferred embodiment the interconnecting member includes a line.

Preferably, the body of the blister pack unit includes a track and the interconnecting member includes an element which is captively disposed within the track and movable between first and second positions.

In a preferred embodiment the track is configured such that with the element of the interconnecting member in one of the first and second positions the interconnecting member is disposed substantially within the track.

The present invention still further provides a powder inhaler which comprises the above-described blister pack assembly.

Preferably, the powder inhaler further comprises a support unit for supporting the blister pack assembly, which support unit includes a plurality of openings for guiding the suction tube into respective blisters in the one of the plurality of surfaces adjacent thereto.

More preferably, the support unit comprises a housing in which the body of the blister pack unit is removably received, with at least one wall of the housing including the openings.

Still more preferably, the support unit further comprises a cover member which is hingeably mounted to the housing and encloses the suction tube and the openings when closed.

Medicaments suitable for use with the present invention are any which may be delivered by inhalation and include, for example, β2-adrenoreceptor agonists, for example, salbutamol, terbutaline, rimiterol, fenoterol, reproterol, adrenaline, pirbuterol, isoprenaline, orciprenaline, bitolterol, salmeterol, formoterol, clenbuterol, procaterol, broxaterol, picumeterol, TA-2005, mabuterol and the like, and their pharmacologically acceptable esters and salts; anticholinergic bronchodilators, for example, ipratropium bromide and the like; glucocorticosteroids, for example, beclomethasone, fluticasone, budesonide,

tipredane, dexamethasone, betamethasone, fluocinolone, triamcinolone acetonide, mometasone and the like, and their pharmacologically acceptable esters and salts; antiallergic medicaments, for example, sodium cromoglycate and nedocromil sodium; expectorants; mucolytics; antihistamines; cyclooxygenase inhibitors; leukotriene synthesis inhibitors; leukotriene antagonists; phospholipase-A2 (PLA2) inhibitors; platelet aggregating factor (PAF) antagonists and prophylactics of asthma; antiarrhythmic medicaments; tranquilisers; cardiac glycosides; hormones; antihypertensive medicaments; antidiabetic medicaments; antiparasitic medicaments; anticancer medicaments; sedatives; analgesic medicaments; antibiotics; antirheumatic medicaments; immunotherapies; antifungal medicaments; antihypotension medicaments; vaccines; antiviral medicaments; proteins; polypeptides and peptides, for example, peptide hormones and growth factors; polypeptide vaccines; enzymes; endorphines; lipoproteins and polypeptides involved in the blood coagulation cascade; vitamins; and others, for example, cell surface receptor blockers, antioxidants, free radical scavengers and organic salts of N,N'-diacetylcystine.

A preferred embodiment of the present invention will now be described hereinbelow by way of example only with reference to the accompanying drawings, in which:

Figure 1 illustrates in use a perspective view of an inhaler in accordance with a preferred embodiment of the present invention;

Figure 2 illustrates an exploded perspective view of the inhaler of Figure 1;

Figure 3 illustrates in enlarged scale a vertical sectional view (along section I-I in Figure 1) of the inhaler of Figure 1;

Figure 4 illustrates in enlarged scale a fragmentary vertical sectional view (along section II-II in Figure 1) of the inhaler of Figure 1;

Figure 5 illustrates in enlarged scale a fragmentary vertical sectional view (along section III-III in Figure 1) of the inhaler of Figure 1;

Figure 6 illustrates an exploded perspective view of the blister pack assembly of the inhaler of Figure 1;

Figure 7(a) illustrates in enlarged scale a plan view of the support member of the blister pack unit of the blister pack assembly of Figure 6;

Figure 7(b) illustrates one side view of the support member of Figure 7(a);

Figure 7(c) illustrates the other side view of the support member of Figure 7(a);

Figure 7(d) illustrates one end view of the support member of Figure 7(a);

Figure 7(e) illustrates the other end view of the support member of Figure 7(a);

Figure 8(a) illustrates in enlarged scale a plan view of one of the blister pack elements of the blister pack assembly of Figure 6;

Figure 8(b) illustrates an underneath plan view of the blister pack element of Figure 8(a);

Figure 8(c) illustrates one side view of the blister pack element of Figure 8(a);

Figure 8(d) illustrates the other side view of the blister pack element of Figure 8(a);

Figure 8(e) illustrates one end view of the blister pack element of Figure 8(a);

Figure 8(f) illustrates the other end view of the blister pack element of Figure 8(a);

Figure 9(a) illustrates a plan view of the interconnecting member of the blister pack assembly of Figure 6;

Figure 9(b) illustrates a side view of the interconnecting member of Figure 9(a);

Figure 10(a) illustrates in enlarged scale a first side view of the suction tube of the blister pack assembly of Figure 6;

Figure 10(b) illustrates a second, orthogonal side view of the suction tube of Figure 10(a);

Figure 10(c) illustrates a plan view of the suction tube of Figure 10(a);

Figure 10(d) illustrates an underneath plan view of the suction tube of Figure 10(a);

Figure 10(e) illustrates a vertical sectional view (along section IV-IV in Figure 10(a)) of the suction tube of Figure 10(a);

Figure 10(f) illustrates a vertical sectional view (along section V-V in Figure 10(b)) of the suction tube of Figure 10(a);

Figure 11(a) illustrates a plan view of the support unit of the inhaler of Figure 1, illustrated in the closed or storage configuration;

Figure 11(b) illustrates a side view of the support unit of Figure 11(a), illustrated in the closed or storage configuration;

Figure 11(c) illustrates one end view of the support unit of Figure 11(a), illustrated in the closed or storage configuration;

Figure 11(d) illustrates the other end view of the support unit of Figure 11(a), illustrated in the closed or storage configuration;

Figure 11(e) illustrates a plan view of the support unit of Figure 11(a), illustrated in the open or operative configuration;

Figure 11(f) illustrates a side view of the support unit of Figure 11(a), illustrated in the open or operative configuration;

Figure 11(g) illustrates in enlarged scale a fragmentary vertical sectional view (along section VI-VI in Figure 11(e)) of the support unit of Figure 11(a), illustrated in the open or operative configuration;

Figure 11(h) illustrates in enlarged scale a fragmentary vertical sectional view (along section VII-VII in Figure 11(e)) of the support unit of Figure 11(a), illustrated in the open or operative configuration;

Figure 11(i) illustrates in enlarged scale a vertical sectional view (along section VIII-VIII in Figure 11(e)) of the support unit of Figure 11(a), illustrated in the open or operative configuration;

Figure 12(a) illustrates a fragmentary vertical sectional view (along section IV-IV in Figure 10(a)) of the suction tube of Figure 10(a) when partly inserted into a blister;

Figure 12(b) illustrates a horizontal sectional view (along section IX-IX in Figure 12(a)) of the suction tube of Figure 10(a) when partly inserted into a blister;

Figure 13(a) illustrates a fragmentary vertical sectional view (along section IV-IV in Figure 10(a)) of the suction tube of Figure 10(a) when further inserted into a blister;

Figure 13(b) illustrates a horizontal sectional view (along section X-X in Figure 13(a)) of the suction tube of Figure 10(a) when further inserted into a blister;

Figure 14(a) illustrates a fragmentary vertical sectional view (along section IV-IV in Figure 10(a)) of the suction tube of Figure 10(a) when fully inserted into a blister; and

Figure 14(b) illustrates a horizontal sectional view (along section XI-XI in Figure 14(a)) of the suction tube of Figure 10(a) when fully inserted into a blister.

The inhaler comprises a support unit 1 and a blister pack assembly 3 which in use is fitted thereto.

The blister pack assembly 3 comprises a blister pack unit 5, a suction tube 7 and an interconnecting member 9 which connects the suction tube 7 to the blister pack unit 5 so as to prevent the suction tube 7 from being inadvertently separated from the blister pack unit 5.

The blister pack unit 5 comprises a support member 10 and first and second blister pack elements 11, 12 fixed, for example, by an adhesive, to the support member 10 so as to present first and second oppositely-directed parallel surfaces.

The support member 10 comprises a frame 13 to which the blister pack elements 11, 12 are fixed and a clip 14 at one edge of the frame 13 which is configured to hold the suction tube 7 when not in use. The frame 13 includes an elongate slot 15 which extends along the central axis from the one edge thereof, the opposing surfaces of which slot 15 include respective grooves 16 which define a closed track in which a mutually configured part of the interconnecting member 9 is captively disposed as will be described in more detail hereinbelow.

The first and second blister pack elements 11, 12 each comprise a substantially planar thin sheet 17, 18 which includes a plurality of cavities 19, 20, each defining a part of a respective blister 21, 22, and an elongate slot 23, 24 which extends along the central axis from one edge thereof such as to overlie the slot 15 in the frame 13 of the support member 10 when fitted thereto. In this embodiment the sheets 17, 18 are formed of a metal, such as aluminium, and the cavities 19, 20 have a depth of about 4 mm and a diameter at the opening thereof of about 7.5 mm. In alternative embodiments the sheets 17, 18 can be formed of a plastics material or a laminate of metal and plastics material.

The first and second blister pack elements 11, 12 each further comprise a thin film 26, 27 which is attached to the substantially planar surface of the sheet 17, 18 thereof so as to cover the openings of each of the cavities 19, 20 and thereby enclose a dose of powder containing medicament in each blister 21, 22. The films 26, 27 each include an elongate slot 29, 30 which extends along the central axis from one edge thereof such as to overlie the respective slots 23, 24 in the sheets 17, 18. In this embodiment the films 26, 27 are formed of a metal, such as aluminium, and are attached to the respective sheets 17, 18 by one of welding or an adhesive.

In this embodiment the first and second blister pack elements 11, 12 are identical and configured such that, when arranged back-to-back so as to present oppositely-directed blister surfaces, the cavities 19 in the first blister pack element 11 are located in spaces between and adjacent the cavities 20 in the second blister pack element 12. In this way, the thickness of the blister pack unit 5 and hence the inhaler is kept to a minimum for blisters 21, 22 of a particular dimension.

The suction tube 7, which will be described in further detail hereinbelow, comprises a generally elongate body 62 which includes an inlet section 63 at one end, which inlet section 63 includes a cutting assembly 64 for cutting the films 26, 27 covering the cavities 19, 20 of the blisters 21, 22 in the blister pack elements 11, 12 and an inlet 65 through which powder containing medicament is in use drawn from a respective blister 21, 22 on

inhalation by a user, an outlet section 67 at the other end, which outlet section 67 includes an outlet 69 and provides a mouthpiece, and an inhalation channel 71 providing fluid communication between the inlet 65 and the outlet 69. The body 62 of the suction tube 7 includes at the outer surface thereof a plurality of ribs 73 for allowing a user to grip the same securely and a peripheral recess 75 for receiving a part of the interconnecting member 9 as will be described in more detail hereinbelow.

The interconnecting member 9 comprises a line 76 of a flexible material, preferably a plastics material, such as nylon, a clip 77 fixed to one end of the line 76 which is located in the peripheral recess 75 in the outer surface of the body 62 of suction tube 7 so as to anchor the line 76 to the same and an element 79 fixed at the other end of the line 76 which is of larger dimension than the gauge of the line 76 and is captively disposed in the slot 15 in the frame 13 of the support member 10. In this embodiment the clip 77 is part-circular and formed of a resilient material so as to be a snap-fit about the body 62 of the suction tube 7. With this configuration, the line 76 is anchored to the suction tube 7 but yet allows the suction tube 7 to rotate relative thereto. As will become apparent hereinbelow, the suction tube 7, in being rotatable relative to the clip 77 of the interconnecting member 9, has a much greater freedom of movement and thereby facilitates use.

The support unit 1 comprises a housing 81 which includes an opening 82 and defines a cavity 83 into which the blister pack unit 5 of the blister pack assembly 3 is in use inserted and a cover member 84 for enclosing the blister pack assembly 3 when not in use.

The housing 81 comprises a first, upper wall member 85 which, in this embodiment, is substantially planar. The upper wall member 85 includes an upper, outer surface 85a and a lower, inner surface 85b adjacent which one of the first and second blister pack elements 11, 12 of the blister pack unit 5 of the blister pack assembly 3 is in use disposed. The upper wall member 85 also includes one free end 86 which defines a part of the opening 82 in the housing 81 through which the blister pack unit 5 is in use inserted. The upper wall member 85 further includes a plurality of openings 87 which each overlie a respective one

of the openings of the cavities 19, 20 of the blisters 21, 22 in the one of the first and second blister pack elements 11, 12 adjacent thereto such that each of the respective blisters 21, 22 can be emptied by inserting the suction tube 7 into a respective one of the openings 87. In this embodiment the openings 87 in the upper wall member 85 are each configured to have the same peripheral shape as the inlet section 63 of the suction tube 7 such that the openings 87 act as positive guides for guiding the inlet section 63 of the suction tube 7 into a respective blister 21, 22 in the one of the first and second blister pack elements 11, 12 adjacent thereto. Each of the openings 87 includes first and second radial extensions 87a, 87b for receiving mutually configured parts on the inlet section 63 of the suction tube 7 as will be described hereinbelow. The radial extensions 87a, 87b of the openings 87 each include a web member 89 which includes upper and lower surfaces 89a, 89b that are substantially parallel respectively to the upper and lower surfaces 85a, 85b of the upper wall member 85 of the housing 81. The web members 89 are of lesser thickness than the upper wall member 85 of the housing 81 and are disposed such that the upper surfaces 89a thereof are stepped back from the upper surface 85a of the upper wall member 85. The upper wall member 85 of the housing 81 further includes an elongate slot 91 which extends from the one free end 86 thereof, in this embodiment along the central axis of the housing 81, and overlies the slot 15 in the frame 13 of the support member 10 of the blister pack unit 5 when fitted such that the line 76 of the interconnecting member 9 can be drawn thereinto and pass freely therealong. The upper wall member 85 still further includes a plurality of elongate ribs 93 which extend downwardly from the lower surface 85b thereof parallel to the central axis of the housing 81. The ribs 93 are provided to ensure that the surface of the one of the first and second blister pack elements 11, 12 adjacent thereto is spaced from the lower surface 85a of the upper wall member 85 and thereby provide an air flow path to the blisters 21, 22 in the one of the first and second blister pack elements 11, 12 adjacent thereto. It will be appreciated that this configuration, in not having the line 76 of the interconnecting member 9 fixed at one point, is advantageous in that the line 76 of the interconnecting member 9 need only be as long as the distance between the furthestmost opening 87 and the elongate slot 91 in the upper wall member 85, which distance, in this embodiment, corresponds to approximately half of the width of the upper

wall member 85. The upper wall member 85 still further includes a recess 94 at that end thereof remote from the opening 82 in the housing 81.

The housing 81 further comprises a second, lower wall member 95, in this embodiment substantially planar, which is spaced in parallel relation to the upper wall member 85, first and second side wall members 97, 99 which extend between the sides of the upper and lower wall members 85, 95 and an end wall member 101 which extends between the ends of the upper and lower wall members 85, 95 remote from the opening 82 in the housing 81. In this embodiment the side wall members 97, 99 and the end wall member 101 each include a channel 97', 99', 101' into which the peripheral edge at the sides and the other end of the blister pack unit 5 of the blister pack assembly 3 is in use located such that one of the first and second blister pack elements 11, 12 is held in position adjacent the lower surface 85b of the upper wall member 85 of the housing 81.

The cover member 84 is hinged to the housing 81, in this embodiment at that end adjacent the opening 82 therein. In a preferred embodiment the housing 81 and the cover member 84 of the support unit 1 are integrally formed of a plastics material such that the hinged connection of the housing 81 and the cover member 84 is provided by a living hinge. The cover member 84 includes a catch member 102 at the free end thereof which is configured to engage the recess 94 in the upper wall member 85 of the housing 81 when the cover member 84 is closed and thereby hold the same closed.

As described hereinabove, the suction tube 7 includes an inlet section 63 which includes a cutting assembly 64 for cutting the films 26, 27 covering the cavities 19, 20 of the blisters 21, 22 in the first and second blister pack elements 11, 12.

The inlet section 63 of the suction tube 7 further includes first and second arms 105, 107 which extend forwardly, in the sense of insertion of the suction tube 7 into a blister 21, 22 in a respective one of the first and second blister pack elements 11, 12, from respective sides thereof and are biased outwardly. The arms 105, 107 are each configured so as to be

a sliding fit in the radial extensions 87a, 87b of the openings 87 in the upper wall member 85 of the housing 81. In this way, the suction tube 7 can only be inserted into an opening 87 in the upper wall member 85 of the housing 81 in one of two orientations and, as will become apparent hereinbelow, since the cutting assembly 64 has two-fold rotational symmetry, the suction tube 7 can never inadvertently be inserted into a blister 21, 22 with another orientation which may cause the film 26, 27 covering the respective blister 21, 22 to be cut free. It will, of course, be appreciated that in any embodiment where the cutting assembly 64 of the suction tube 7 does not have such rotational symmetry the first and second arms 105, 107 at the inlet section 63 and the radial extensions 87a, 87b of the openings 87 in the upper wall member 85 of the housing 81 can be configured so as to permit the suction tube 7 to be inserted into the openings 87 in the upper wall member 85 of the housing 81 in only one orientation. Each of the first and second arms 105, 107 includes a catch member 109, 111 which is configured to engage with the web members 89 in the radial extensions 87a, 87b of the openings 87 in the upper wall member 85 of the housing 81. The catch members 109, 111 on the first and second arms 105, 107 each have a first surface 109a, 111a which has a forwardly-directed component and acts as a guiding surface and a second surface 109b, 111b which has a rearwardly-directed component and acts as a locking surface. In use, on fitting the suction tube 7 to the housing 81, the second, locking surfaces 109b, 111b of the catch members 109, 111 snap behind respective ones of the lower surfaces 89b of the web members 89 in the radial extensions 87a, 87b of the openings 87 in the upper wall member 85 of the housing 81 so as to prevent the suction tube 7 from falling out of the respective opening 87 and thereby avoid the need for the user continuously to hold the suction tube 7 in position. It will be appreciated that the catch members 109, 111, in being a snap fit, provide the user with a clear indication that the suction tube 7 is correctly fitted to the housing 81 and hence inserted into a respective one of the blisters 21, 22 in the one of the first and second blister pack elements 11, 12 adjacent thereto. In this regard, the second, locking surfaces 109b, 111b of the catch members 109, 111 are configured so as to allow the suction tube 7 to be removed from a respective one of the openings 87 in the upper wall member 85 of the housing 81 after use on the application of a light force.

The inlet section 63 of the suction tube 7 yet further includes first and second lugs 115, 116 which extend radially therefrom and each include a lower surface 115', 116' which defines a first shoulder that acts to limit the extent to which the suction tube 7 can be inserted into any of the openings 87 in the upper wall member 85 of the housing 81 and hence a respective blister 21, 22 in the one of the first and second blister pack elements 11, 12 adjacent thereto. In this embodiment the lugs 115, 116 are configured such that the shoulder defined by the lower surfaces 115', 116' thereof abuts the upper surface 85a of the upper wall member 85 of the housing 81 on the required insertion of the suction tube 7 into one of the openings 87 in the upper wall member 85 of the housing 81. In this way, the suction tube 7 cannot be inserted too far into a blister 21, 22 which could result in the cutting assembly 64 at the inlet section 63 of the suction tube 7 being forced inadvertently through the cavity 19, 20 of any blister 21, 22 on fitting the suction tube 7 to the housing 81.

The inlet section 63 of the suction tube 7 still further includes first and second axially-extending members 117, 119 which each include a lower surface 117', 119' that defines a second shoulder which is axially forward, in the sense of inserting the suction tube 7 into one of the openings 87 in the upper wall member 85 of the housing 81, of the first shoulder defined by the lower surfaces 115', 116' of the lugs 115, 116. In this embodiment the first and second axially-extending members 117, 119 are configured such that the second shoulder defined by the lower surfaces 117', 119' thereof abuts the upper surface of the one of the first and second blister pack elements 11, 12 adjacent thereto when the first shoulder defined by the lower surfaces 115', 116' of the lugs 115, 116 abuts the upper surface 85a of the upper wall member 85 of the housing 81.

The cutting assembly 64 of the inlet section 63 of the suction tube 7 comprises a cutting blade 127 and first and second ram blades 129, 131 disposed adjacent thereto.

The cutting blade 127 includes a cutting edge 133 which extends across and is located axially forward, in the sense of inserting the suction tube 7 into one of the openings 87 in the upper wall member 85 of the housing 81, of the inlet 65 of the suction tube 7 such that, on insertion of the suction tube 7 into one of the openings 87 in the upper wall member 85 of the housing 81, a cut is made in the film 26, 27 covering the opening of the cavity 19, 20 of the blister 21, 22 therebeneath. In this embodiment the cutting edge 133 of the cutting blade 127 includes a cutting point 133'. The cutting blade 127, which in this embodiment is substantially planar, is co-axial with the longitudinal axis of the body 62 of the suction tube 7 and includes first and second flank sections 127a, 127b which taper to an axially-foremost cutting point 127c located on the longitudinal axis of the body 62 of the suction tube 7. In this embodiment the flank sections 127a, 127b of the cutting blade 127 enclose an angle of about 120 degrees. The cutting blade 127 has an effective cutting length approaching that of the diameter of the openings to the cavities 19, 20 of the blisters 21, 22 in the blister pack elements 11, 12 such that, on insertion of the suction tube 7 into a respective one of the openings 87 in the upper wall member 85 of the housing 81, the cutting blade 127 cuts the film 26, 27 across the diameter of the opening to the cavity 19, 20 of the respective blister 21, 22. The cutting blade 127 further includes a transverse opening 134 located behind the cutting edge 133 thereof for providing an air flow path therethrough.

The first and second ram blades 129, 131, which in this embodiment are each substantially planar, are located to each side of the cutting blade 127 and, as will be described in more detail hereinbelow, are configured to bear on and push back the film 26, 27 covering the cavity 19, 20 of a respective one of the blisters 21, 22 once cut by the cutting blade 127 and thereby open the blister 21, 22. In this embodiment the first and second ram blades 129, 131 are disposed parallel to, and are the same radial distance from, the cutting blade 127. The first and second ram blades 129, 131 each include a lower, axially-forward surface 129', 131' which is located axially rearward of the axially foremost part of the cutting edge 133 of the cutting blade 127 such that the ram blades 129, 131 act on the film 26, 27 only

once at least partly cut by the cutting blade 127. In this embodiment the bearing surface 129', 131' of each of the ram blades 129, 131 is substantially flat.

In a preferred embodiment the cutting assembly 64 is configured such that the effective length of each of the bearing surfaces 129', 131' of the ram blades 129, 131, that is, the distance between the endmost points of the bearing surface 129', 131' of each of the ram blades 129, 131, is approximately the same distance as the distance between the adjacent endmost points of the bearing surfaces 129', 131' of the ram blades 129, 131 and the endmost points of the effective cutting length of the cutting blade 127. In this way, the film 26, 27 covering the openings of the cavities 19, 20 of any of the blisters 21, 22 in the blister pack elements 11, 12 will be broken into flaps 136a-f of substantially equal size.

The action of the cutting assembly 64 at the inlet section 63 of the suction tube 7 is clearly illustrated in Figures 12 to 14. In a first step, as illustrated in Figures 12(a) and 12(b), as the cutting assembly 64 is inserted into a blister 21, 22 the cutting blade 127 makes a cut 135 across the diameter of the film 26, 27 covering the opening of the cavity 19, 20 of the blister 21, 22. In a second step, as illustrated in Figures 13(a) and 13(b), as the cutting assembly 64 is inserted further into the blister 21, 22 the bearing surfaces 129', 131' of the ram blades 129, 131 act on the film 26, 27 and cause the film 26, 27 to tear between adjacent endmost points of the bearing surface 129', 131' of the ram blades 129, 131 and the ends 135' of the cut 135 so as to form six flaps 136a-f. As mentioned hereinabove, in a preferred embodiment the cutting blade 127 and the ram blades 129, 131 are configured such that the flaps 136a-f are of substantially equal size. In a final step, as illustrated in Figures 14(a) and 14(b), the cutting assembly 64 is inserted further into the blister 21, 22 until the second shoulder defined by the lower surfaces 117', 119' of the axially-directed members 117, 119 is at the upper surface of the one of the first and second blister pack elements 11, 12 adjacent thereto. In this position the suction tube 7 is inserted fully into the blister 21, 22. In inserting the cutting assembly 64 further into the blister 21, 22 the ram blades 129, 131 cause the flaps 136a-f to be pushed to the wall of the cavity 19, 20 of

the blister 21, 22 so as to provide a large opening in the film 26, 27 covering the blister 21, 22 which allows for the ready withdrawal of powder therefrom.

The inlet section 63 of the suction tube 7 still yet further includes first and second upper supplementary air inlet openings 137, 139 into the inhalation channel 71 of the suction tube 7. The first and second upper supplementary air inlet openings 137, 139 into the inhalation channel 71 provide supplementary air flow paths, which, on inhalation by a user, allow supplementary air to be drawn into the inhalation channel 71 and mix with the air and powder mixture drawn through the inhalation channel 71 from a blister 21, 22. As will be appreciated, the provision of such supplementary air flow paths provides that for each unit volume of air inhaled the user inhales a reduced amount of powder containing medicament. Furthermore, the action of supplementary air mixing with an air and powder mixture drawn through the inhalation channel 71 induces turbulence and assists in the deagglomeration of that powder.

In use, a user first inserts a blister pack assembly 3 into the cavity 83 in the housing 81 of the support unit 1, with one of the blister pack elements 11, 12, in this embodiment the first blister pack element 11, adjacent the inner surface 85b of the upper wall member 85 of the housing 81. The user then unclips the suction tube 7 from the clip 14 of the support member 10 and inserts the inlet section 63 of the suction tube 7 through a respective opening 87 in the upper wall member 85 of the housing 81 and into an unused blister 21 therebeneath; with the opening 87 acting as a guide and the cutting assembly 64 of the suction tube 7 rupturing the film 26 covering the respective blister 21. With the inlet section 63 of the suction tube 7 located in the blister 21, the user then grips the outlet section 67 of the suction tube 7 in the lips and inhales so as to withdraw the dose of powder from the blister 21 and deliver the same into the lungs. After inhalation, the user clips the suction tube 7 back in the clip 14. This pattern of use can be repeated until all of the blisters 21 in the first blister pack element 11 have been used. When all of the blisters 21 in the first blister pack element 11 have been used, the user then withdraws the blister pack assembly 3 from the housing 81, rotates the same through 180 degrees about the axis of

insertion and re-inserts the blister pack unit 5 of the blister pack assembly 3 into the cavity 83 in the housing 81, with the second blister pack element 12 adjacent the lower surface 85b of the upper wall member 85 of the housing 81 in which the openings 87 are provided. In this way, the blisters 22 in the second blister pack element 12 are available for use. When all of the blisters 22 in the second blister pack element 12 have been used, the user then withdraws the blister pack assembly 3 from the housing 81, disposes of the same and inserts a new blister pack assembly 3 into the cavity 83 in the housing 81. Where the blisters 21 in the first blister pack element 11 contain a different medicament to the blisters 22 in the second blister pack element 12, the blister pack assembly 3 is withdrawn, rotated and re-inserted as and when required to expose the respective blisters 21, 22 for use.

Finally, it will be understood by a person skilled in the art that the present invention is not limited to the described embodiment but can be modified in many different ways without departing from the scope of the invention as defined in the appended claims.

In one alternative embodiment the first and second blister pack elements 11, 12 could be provided as sections of a single element which includes a hinge section therebetween, with the single element being folded about the hinge section so as to present the first and second blister pack elements 11, 12 as oppositely-directed parallel surfaces when fitted to the support member 10.

In other alternative embodiments the blister pack unit 5 could include three or more blister pack elements, for example, any of three to six blister pack elements each being arranged as a surface of a respective triangular, square, pentagonal or hexagonal structure, with the housing 81 of the support unit 1 being modified accordingly.

CLAIMS

1. A blister pack unit for a powder inhaler, comprising a body which includes a plurality of surfaces which each include a plurality of blisters (21, 22) containing powder containing medicament and are rotationally symmetrically disposed about an imaginary axis.

2. The blister pack unit of claim 1, wherein the body includes a support member (10) which supports the plurality of surfaces.

3. The blister pack unit of claim 2, wherein the support member (10) comprises a frame (13).

4. The blister pack unit of any of claims 1 to 3, wherein the body includes first and second oppositely-directed surfaces.

5. The blister pack unit of claim 4, wherein the first and second surfaces are substantially parallel.

6. The blister pack unit of claim 4 or 5, wherein the blisters (21, 22) in the first and second surfaces are configured such that the blisters (21) in the first surface are disposed in one or both of spaces between and adjacent the blisters (22) in the second surface.

7. The blister pack unit of any of claims 1 to 6, wherein the plurality of surfaces are defined by separate elements (11, 12).

8. The blister pack unit of any of claims 1 to 6, wherein the plurality of surfaces are defined by a single element.

9. A blister pack assembly comprising the blister pack unit (5) of any of claims 1 to 8 and a suction tube (7) which includes a cutting assembly (64) which is configured for insertion into a respective one of the blisters (21, 22) and an inhalation channel (71) through which powder is in use inhaled.

10. The blister pack assembly of claim 9, wherein the body includes a clip (14) for holding the suction tube (7) when not in use.

11. The blister pack assembly of claim 9 or 10, further comprising an interconnecting member (9) for connecting the suction tube (7) to the blister pack unit (5) so as to prevent the suction tube (7) from being separated from the blister pack unit (5).

12. The blister pack assembly of claim 11, wherein the interconnecting member (9) includes a line (76).

13. The blister pack assembly of claim 11 or 12, wherein the body of the blister pack unit (5) includes a track and the interconnecting member (9) includes an element (79) which is captively disposed within the track and movable between first and second positions.

14. The blister pack assembly of claim 13, wherein the track is configured such that with the element (76) of the interconnecting member (9) in one of the first and second positions the interconnecting member (9) is disposed substantially within the track.

15. A powder inhaler comprising the blister pack unit (5) of any of claims 1 to 8.

16. A powder inhaler comprising the blister pack assembly (3) of any of claims 9 to 14.

17. The powder inhaler of claim 16, further comprising a support unit (1) for supporting the blister pack assembly (3), which support unit (1) includes a plurality of openings

(87) for guiding the suction tube (7) into respective blisters (21, 22) in the one of the plurality of surfaces adjacent thereto.

18. The powder inhaler of claim 17, wherein the support unit (1) comprises a housing (81) in which the body of the blister pack unit (5) is removably received, with at least one wall (85) of the housing (81) including the openings (87).

19. The powder inhaler of claim 18, wherein the support unit (1) further comprises a cover member (84) which is hingeably mounted to the housing (81) and encloses the suction tube (7) and the openings (87) when closed.

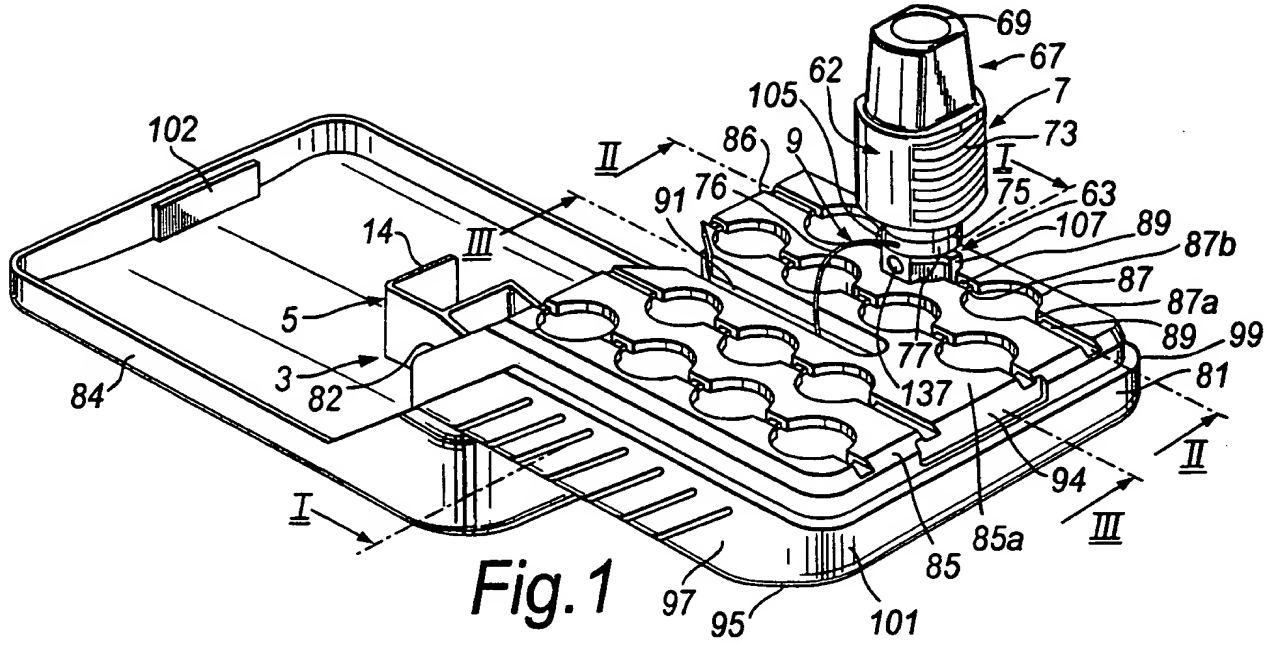

69
67
62
105
7
102
73
II
86
9
I
91
76
75
63
14
III
107
89
87b
87
5
87a
77
89
99
3
82
137
81
84
II
94
I
III
85a
85
97
95
101

Fig.1

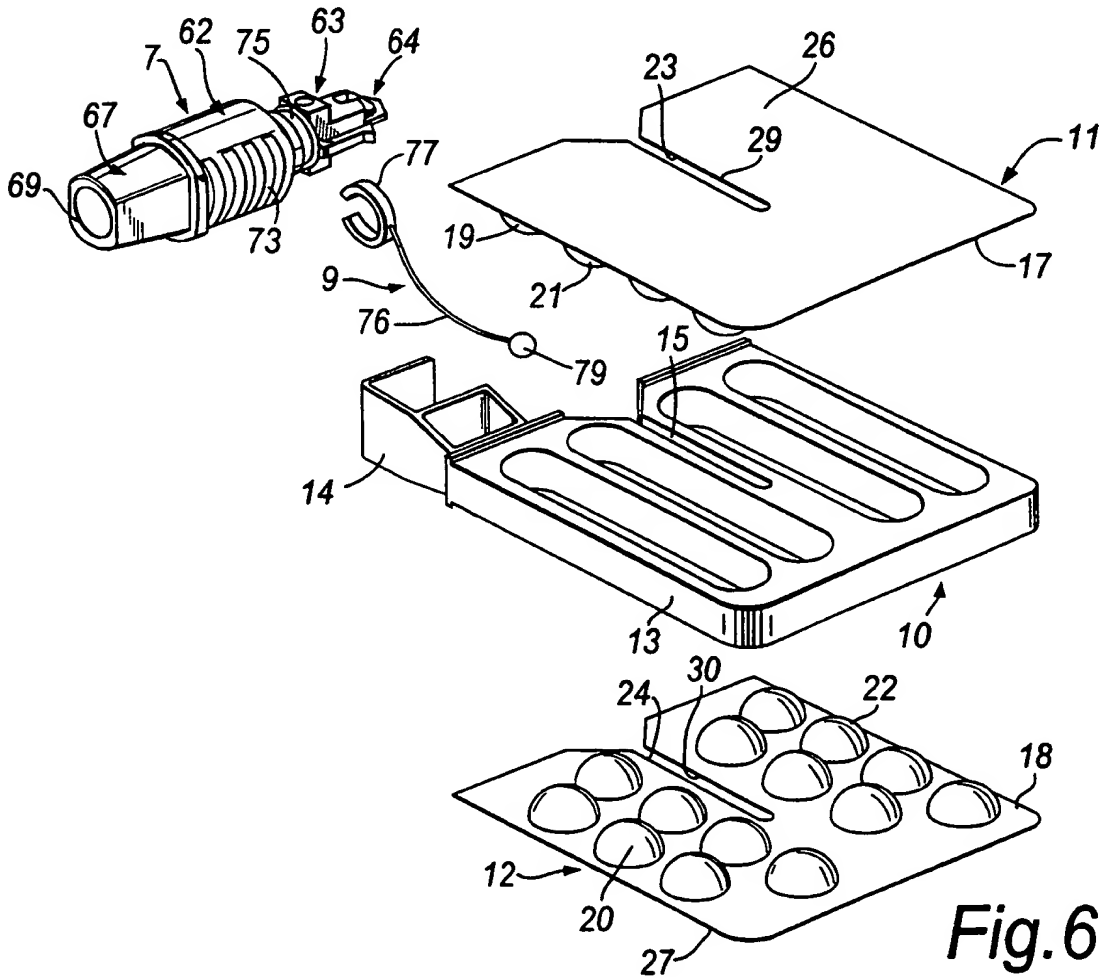

62
75
63
64
7
67
69
73
77
9
76
79
23
26
29
11
19
21
17
15
14
13
10
24
30
22
18
12
20
27

Fig.6

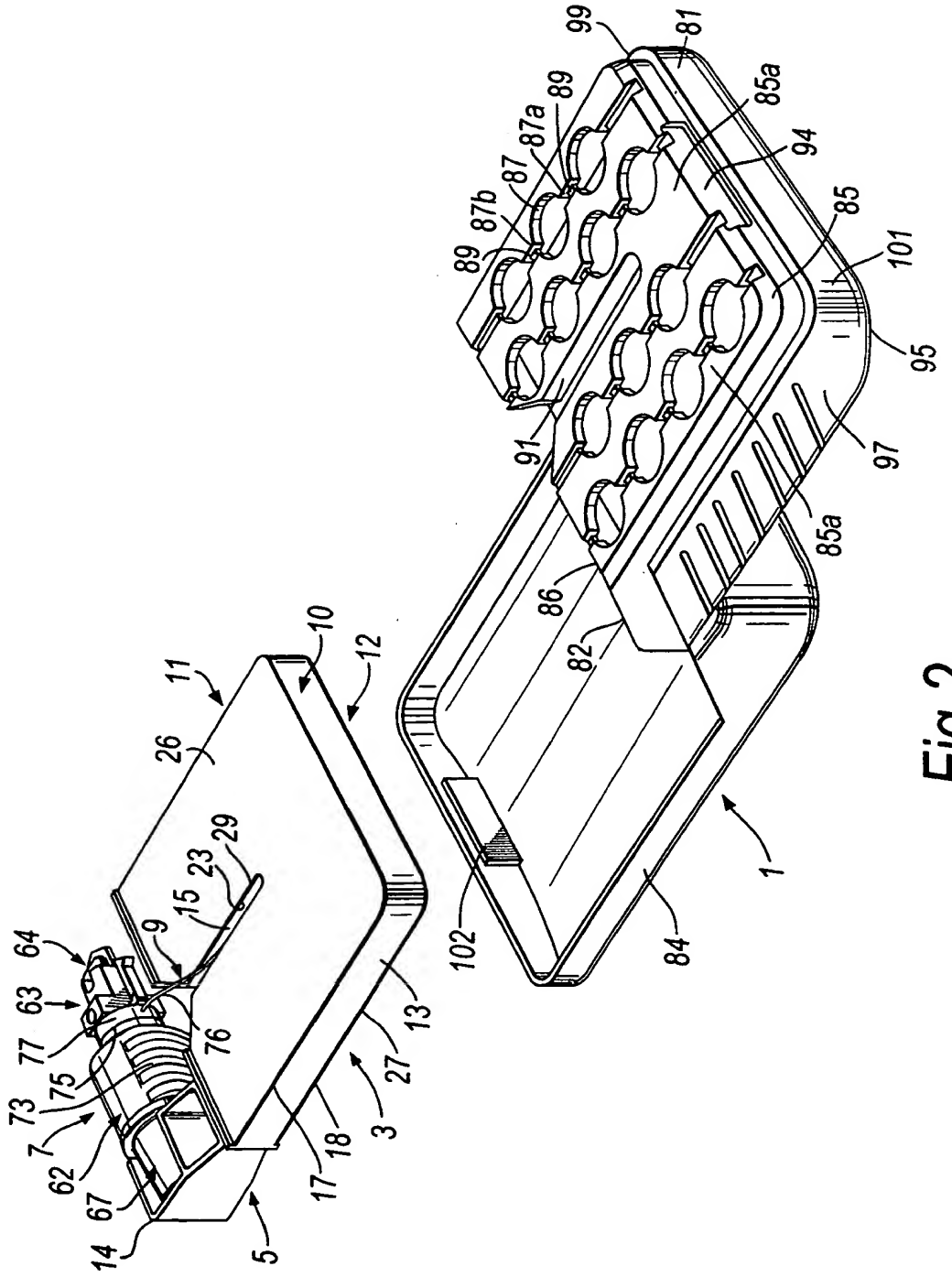

99
81
85a
89
87a
87
94
87b
85
89
101
95
91
97
85a
86
82
102
84
1
10
12
11
26
29
23
15
9
64
63
77
76
73
75
7
62
67
14
5
17
18
3
27
13

Fig.2

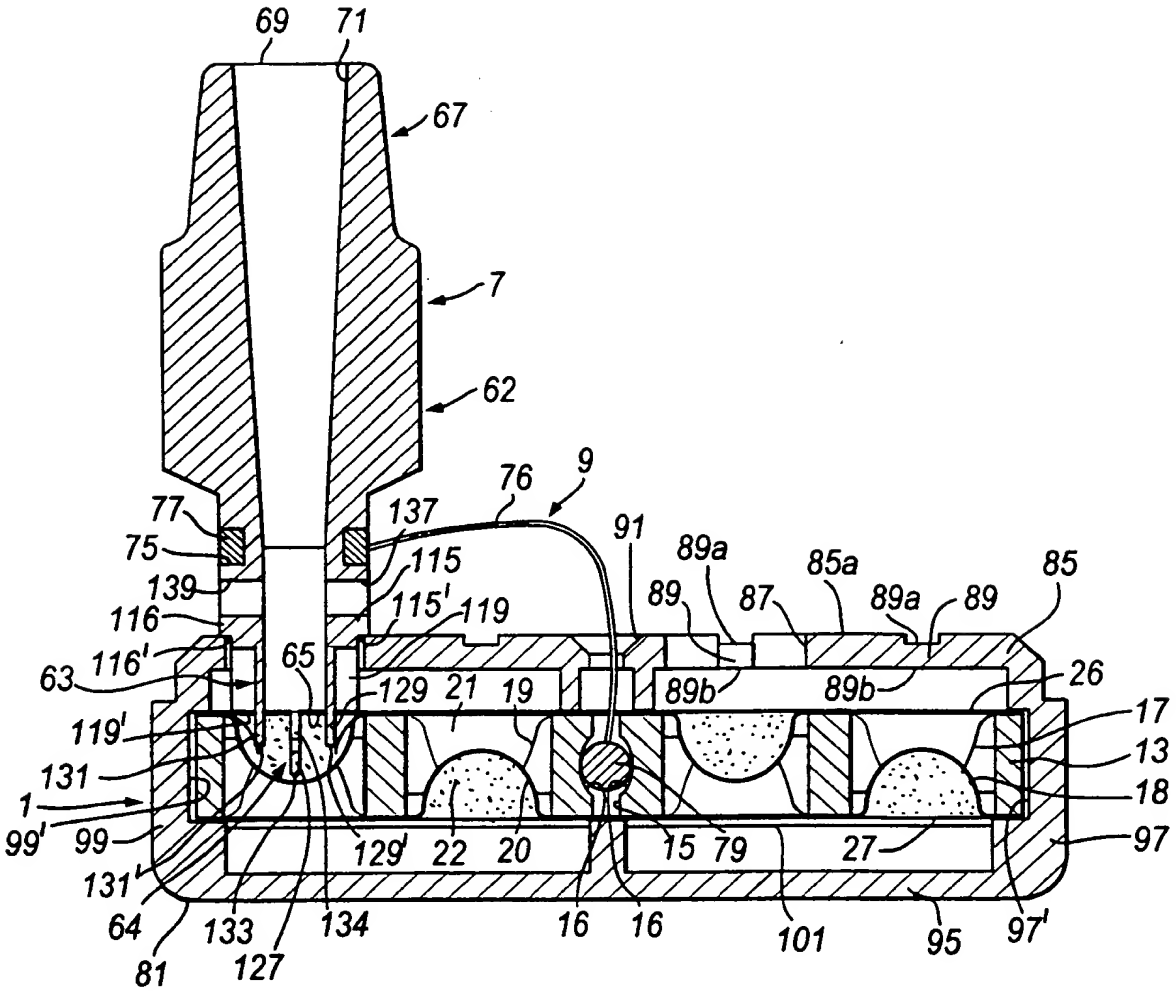

69
71
67
7
62
76
9
77
137
91
89a
85a
85
75
115
89
87
89a
89
139
115'
119
116
116'
65
26
63
129
21
19
89b
89b
119'
17
131
13
1
18
99'
99
129'
22
20
15
79
27
97
131'
64
133
134
16
16
101
95
97'
81
127

Fig.3

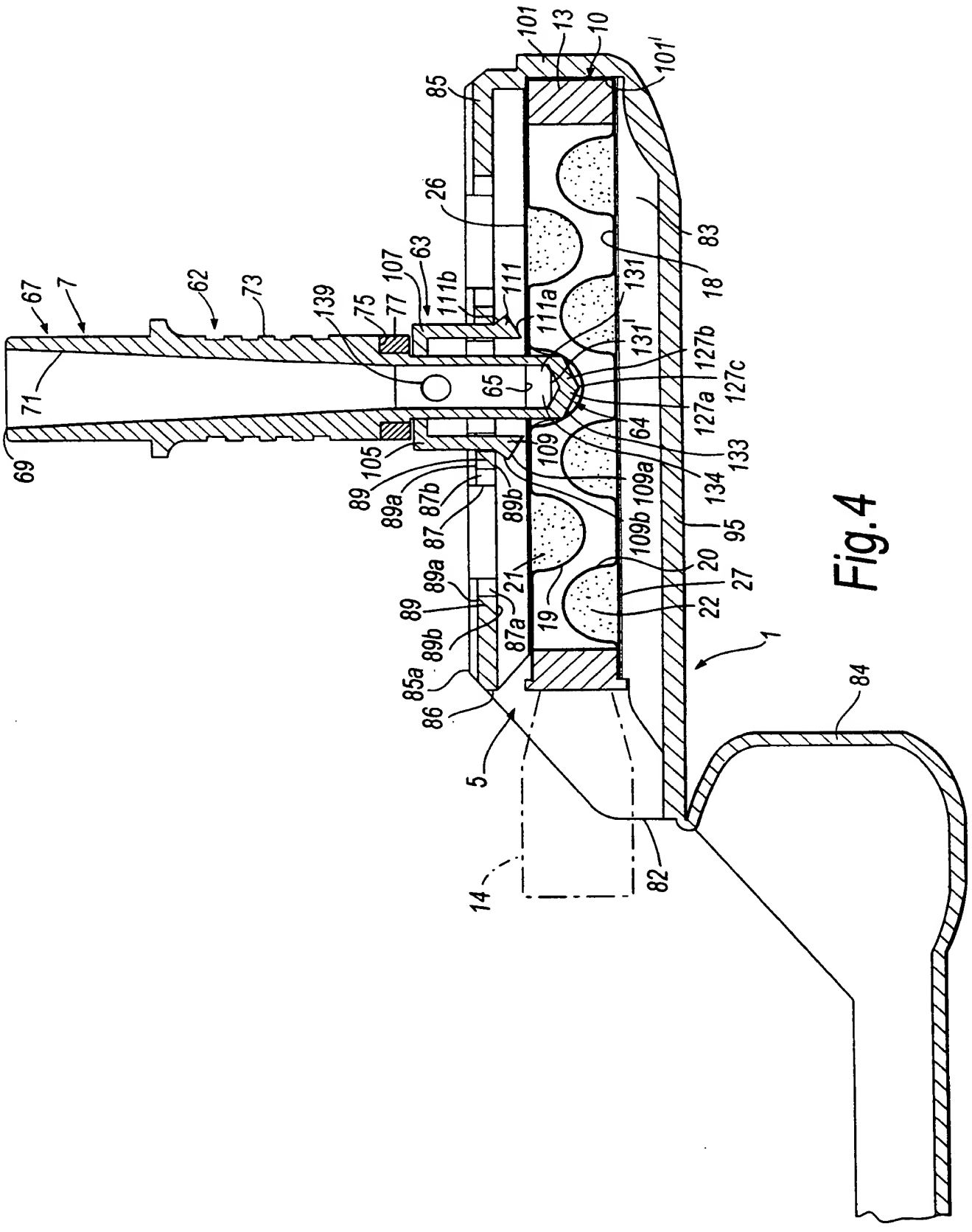

101
13
10
101'
85
26
83
18
67
7
62
73
139
75
77
107
63
111b
111
111a
131
131'
127b
127c
127a
65
71
64
109
133
69
105
89
89a
87b
87
89b
109a
134
109b
95
20
27
89a
21
89
19
22
87a
89b
1
85a
84
86
5
14
82

Fig.4

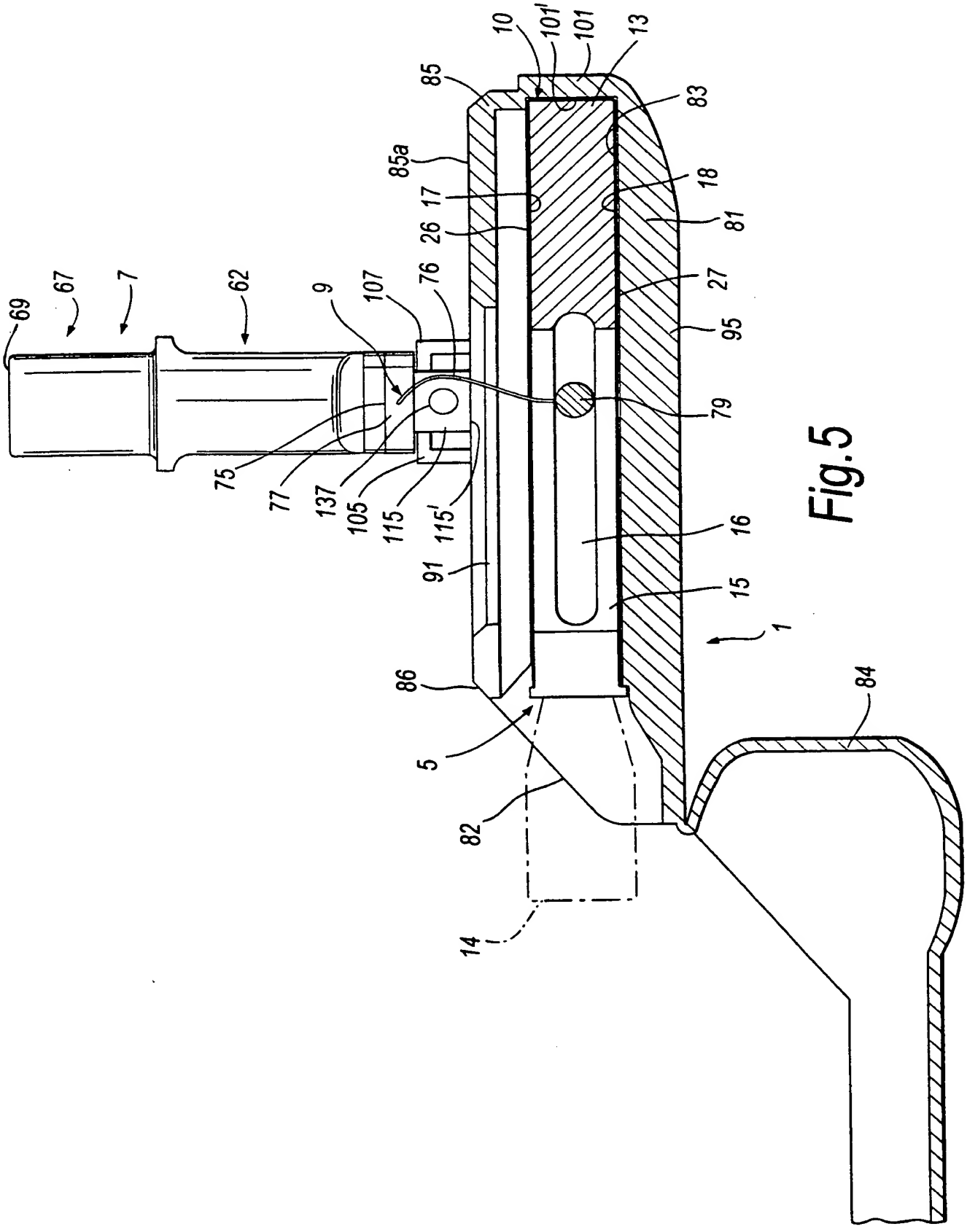

10
101'
101
13
85
83
85a
18
17
81
26
27
76
107
9
62
7
67
69
95
79
75
77
137
105
115
115'
91
16
15
1
86
84
5
82
14

Fig.5

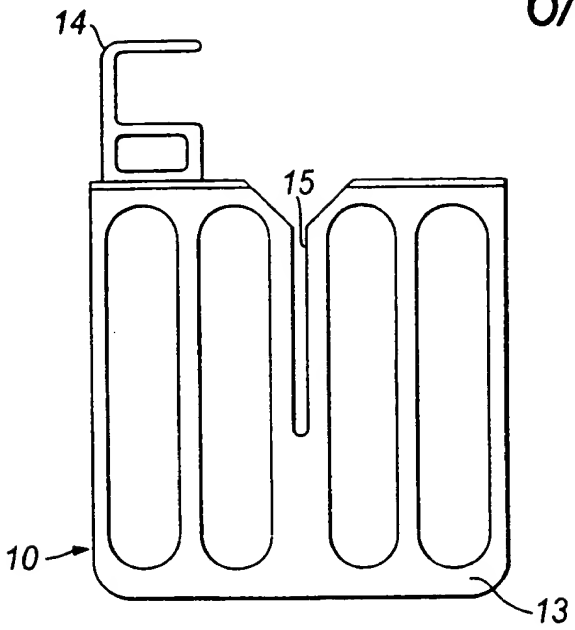


Fig.7(a)

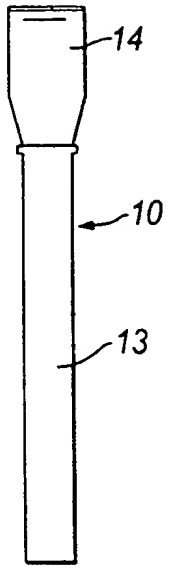


Fig.7(b)

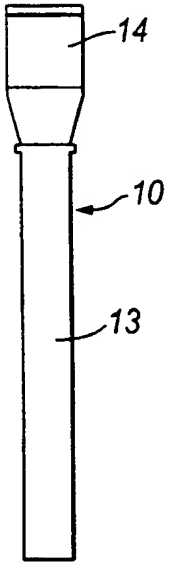


Fig.7(c)

Fig.7(d)

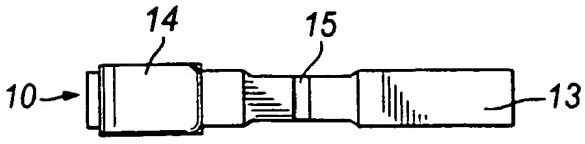


Fig.7(e)

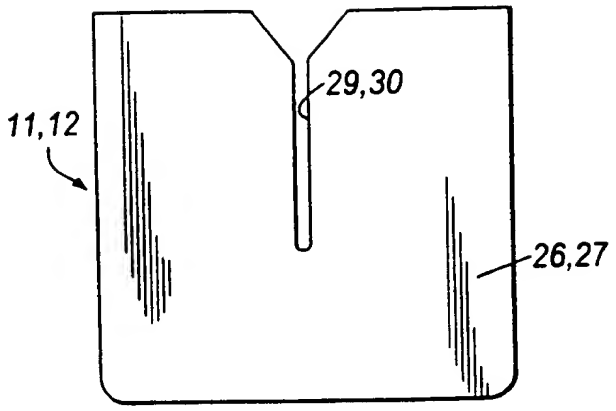


Fig.8(a)

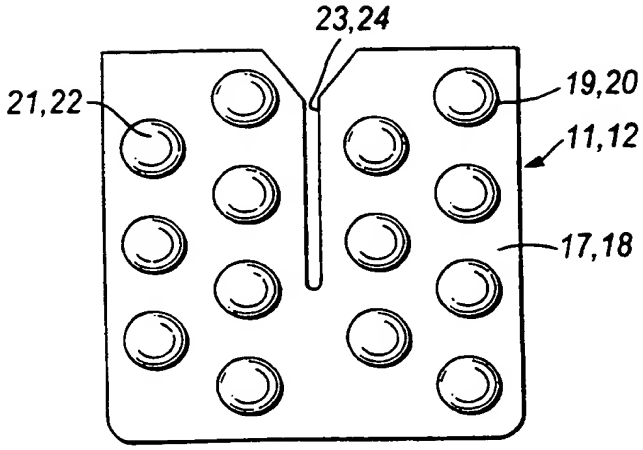


Fig.8(b)

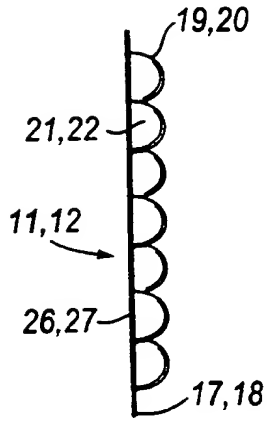


Fig.8(c)

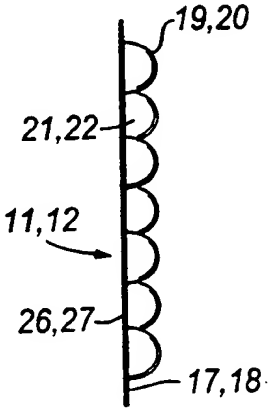


Fig.8(d)

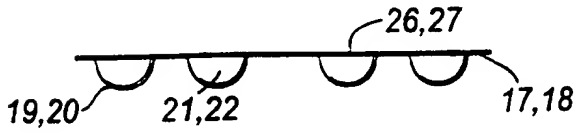


Fig.8(e)

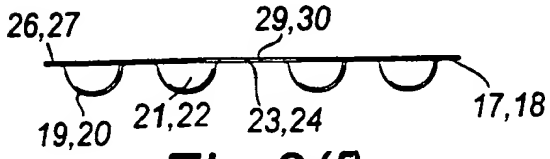


Fig.8(f)

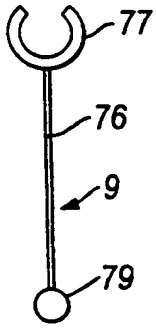


Fig.9(a)

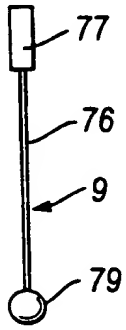


Fig.9(b)

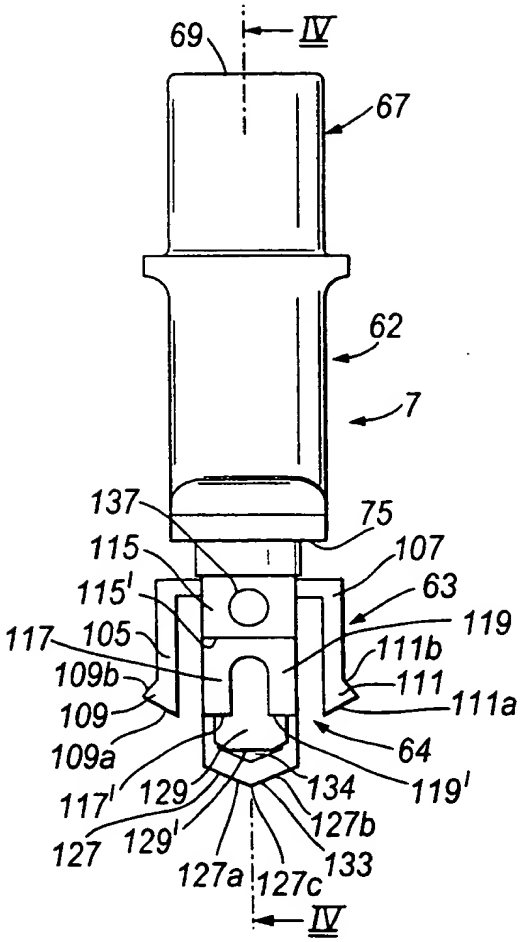


Fig.10(a)

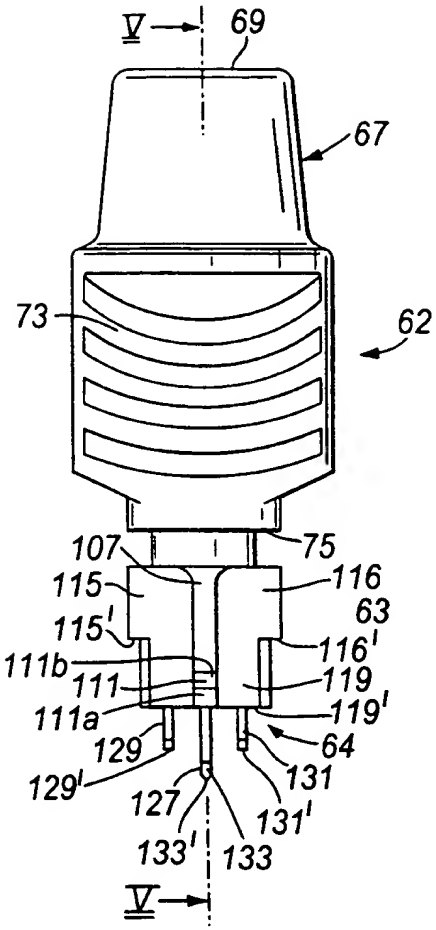


Fig.10(b)

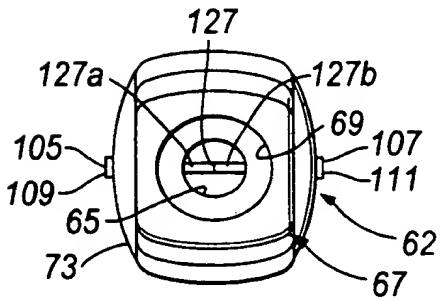


Fig.10(c)

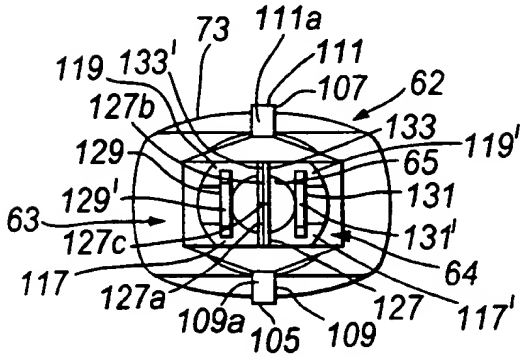


Fig.10(d)

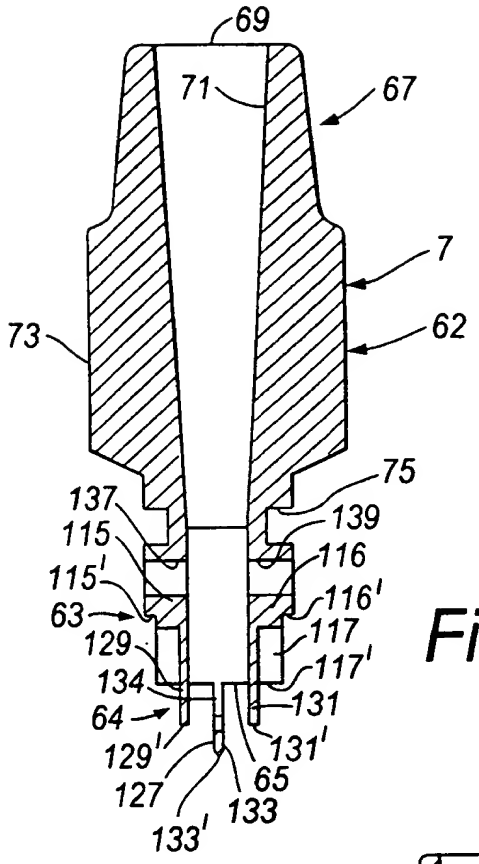


Fig.10(e)

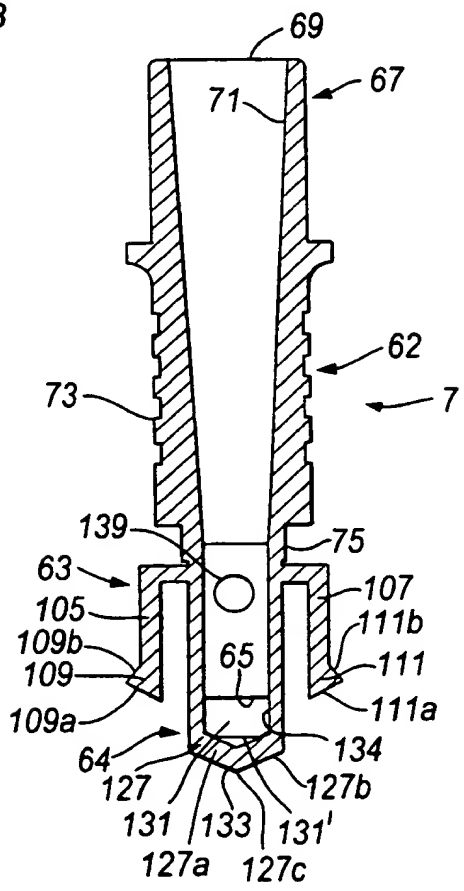


Fig.10(f)

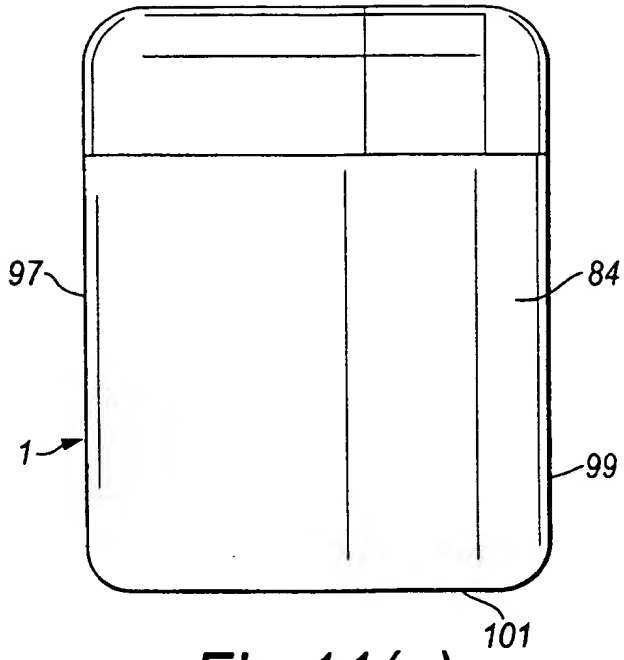


Fig.11(a)

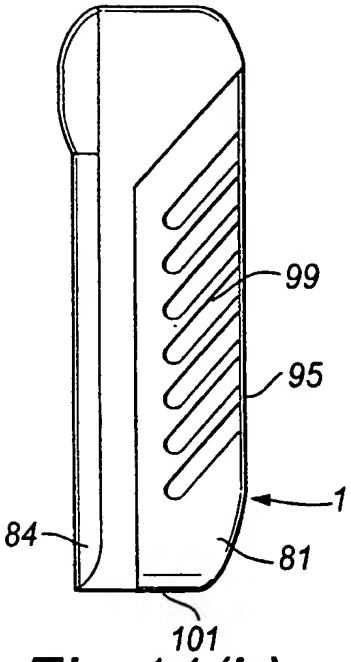


Fig.11(b)

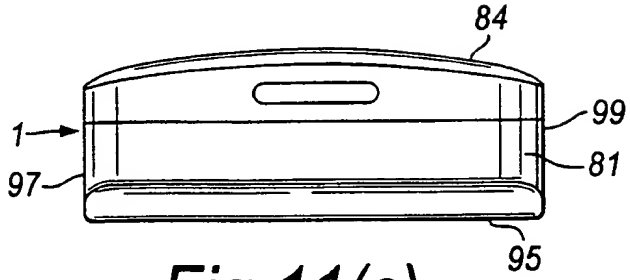


Fig.11(c)

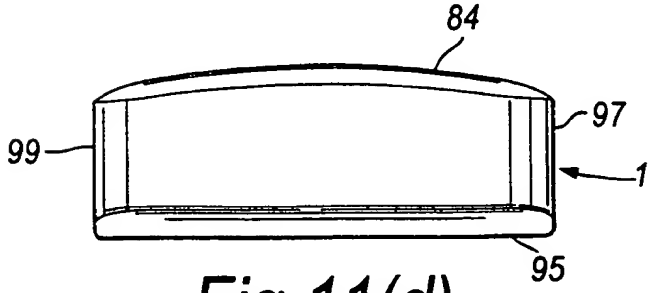


Fig.11(d)

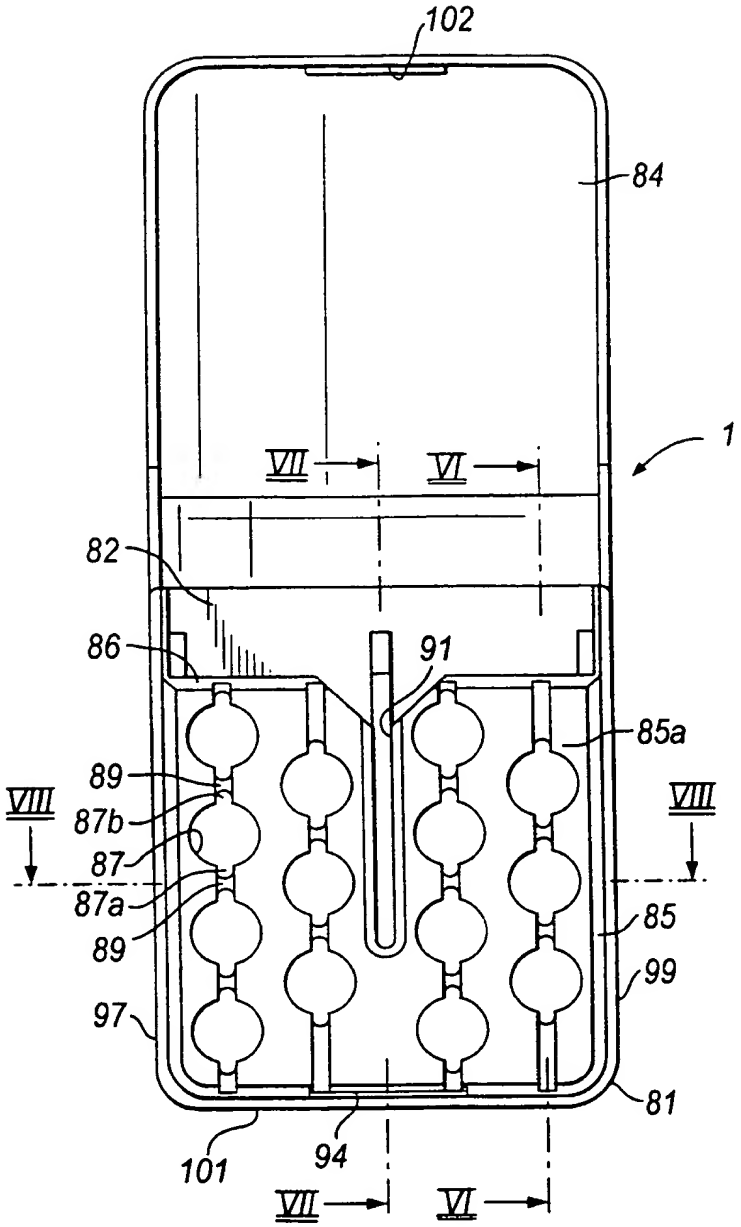


Fig.11(e)

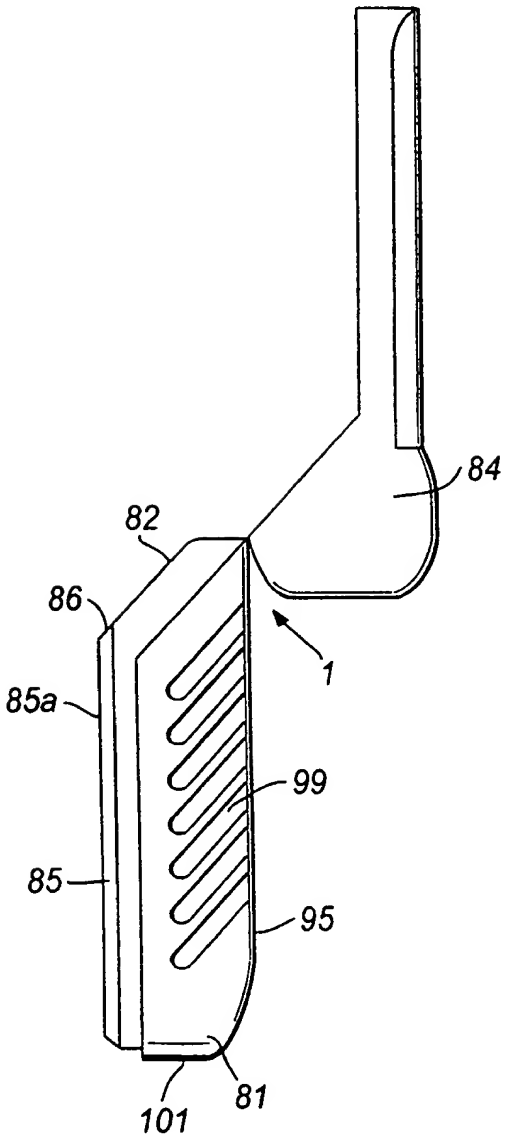


Fig.11(f)

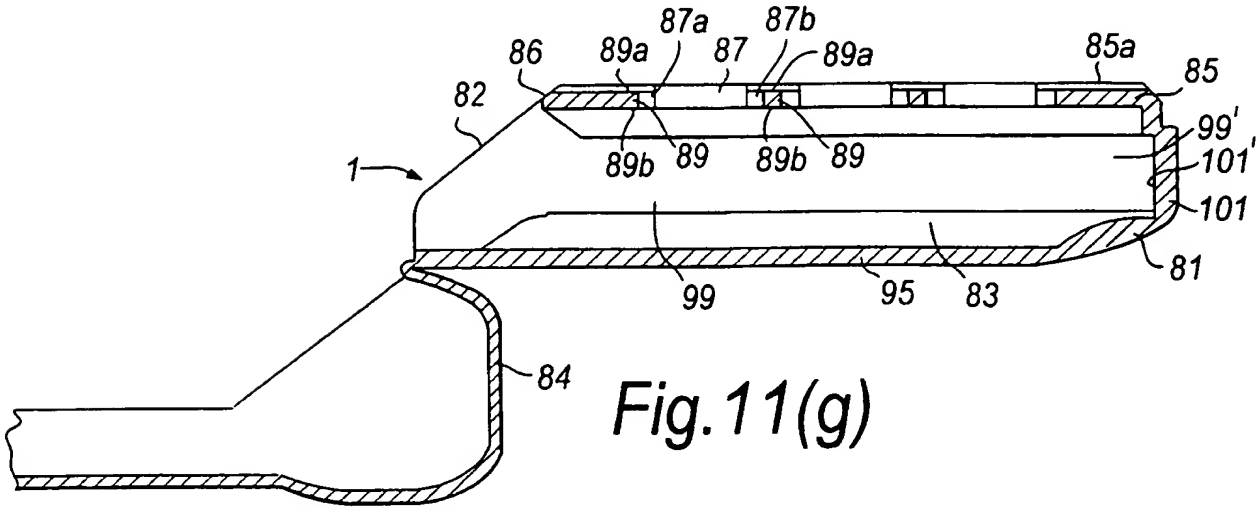


Fig.11(g)

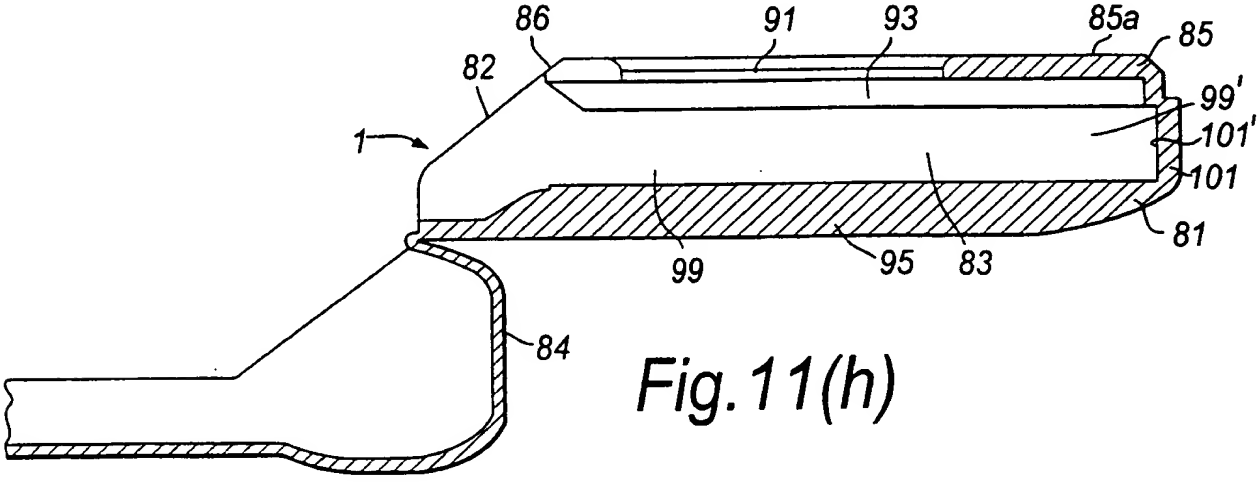


Fig.11(h)

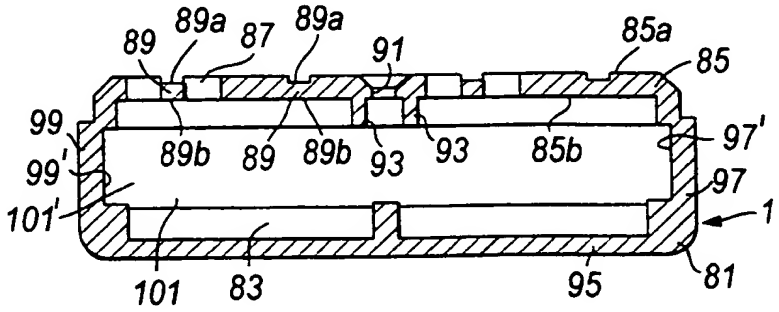


Fig.11(i)

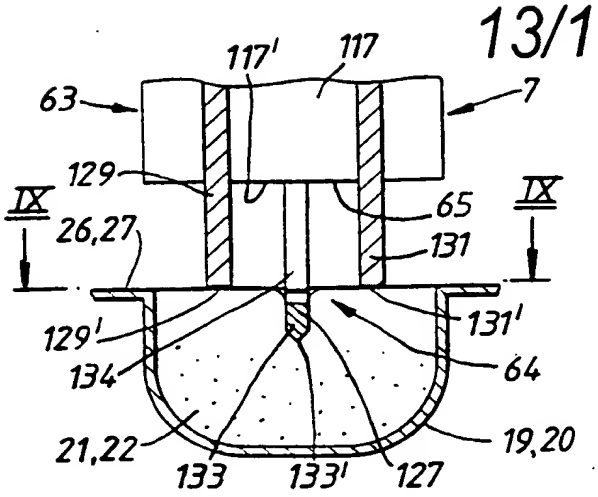


Fig.12(a)

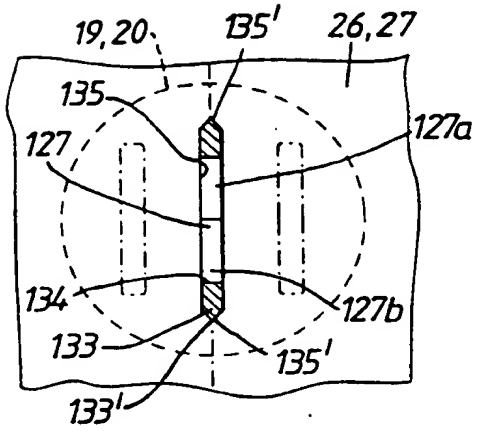


Fig.12(b)

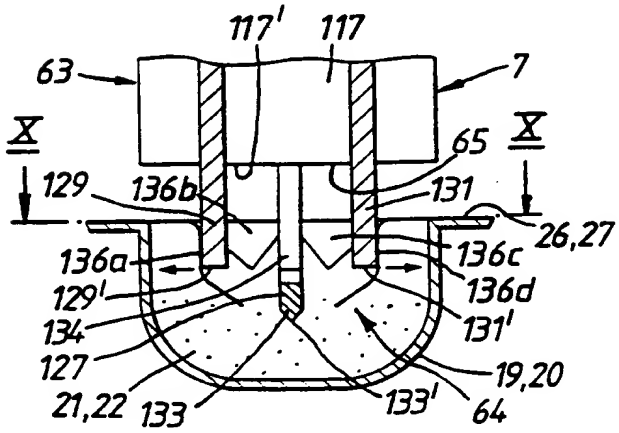


Fig.13(a)

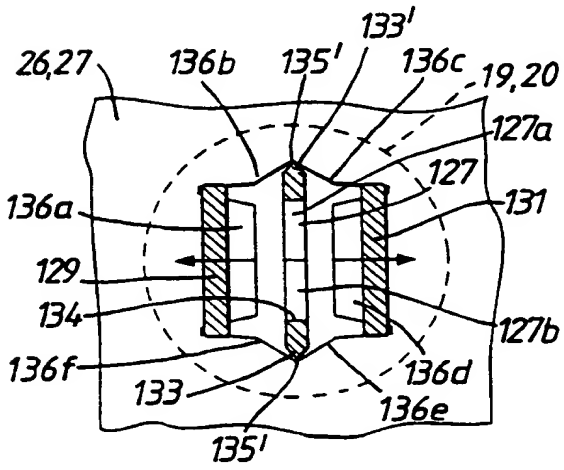


Fig.13(b)

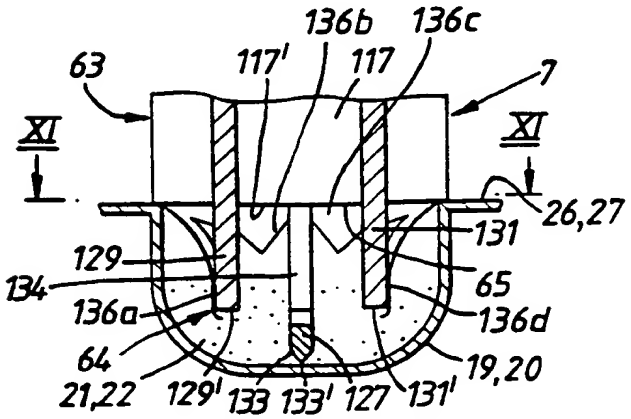


Fig.14(a)

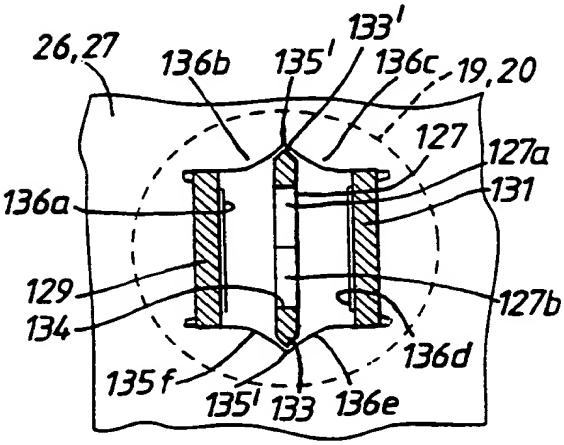


Fig.14(b)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 99/00416

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A61J 1/03, A61M 15/00, B65D 75/36
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: A61J, A61M, B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 4429503 A1 (KREFT, KLAUS A.), 22 February 1996 (22.02.96), figures 2,3	1-8
Y		9-19
	--	
Y	WO 9740876 A1 (VON SCHUCKMANN, ALFRED), 6 November 1997 (06.11.97), page 5, line 24 - page 7, line 23; page 8, line 17 - line 19	9-19
	--	

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 June 1999	09 -07- 1999
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Lotta Gunnarsson Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

01/06/99

International application No.
PCT/SE 99/00416

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 4429503 A1	22/02/96	NONE	
WO 9740876 A1	06/11/97	AU 2771997 A	19/11/97
		DE 19619536 A	30/10/97
		NO 984944 A	23/10/98